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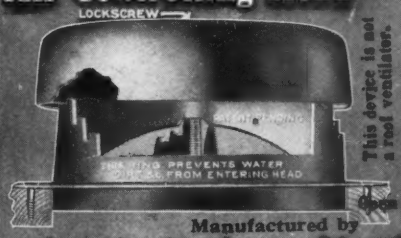

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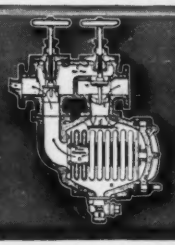

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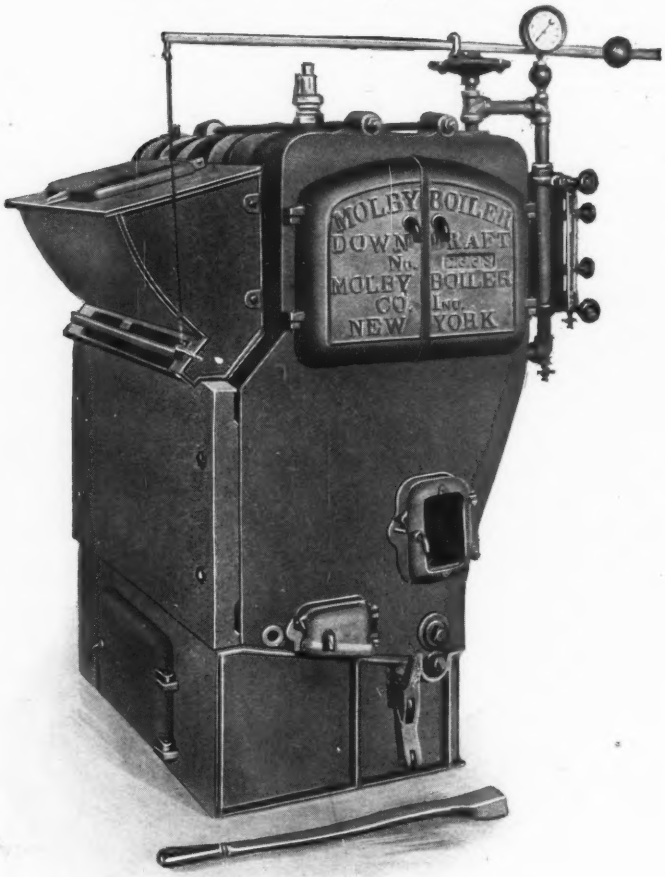

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THE HEATING AND VENTILATING MAGAZINE

1123 BROADWAY NEW YORK DECEMBER, 1915

Notes on the Use of Heating Coils

WITH EXAMPLES OF PROPER AND IMPROPER DESIGN.

BY T. W. REYNOLDS.

A method of heating the smaller rooms of factories by direct steam radiation is shown in Figs. 1 and 2. If the available space along the outer exposed walls is limited, as sometimes occurs, the radiation is placed overhead in the form of horizontal ceiling pipe coils, although in this location they are somewhat less efficient. Naturally, the most effective radiation is that whose surfaces are exposed to the coldest air currents. This and other reasons favor the installation of wall radiation, although it must be remembered that the advantages thereby secured are slightly offset in the use of ceiling coils in that each pipe is more efficient than when placed in a wall coil. When either arrangement is followed, the coils should be set at a sufficient distance from the wall or ceiling to allow for a free circulation of air around their parts. Overhead radiation should be at least 12 inches below the ceiling.

Ceiling coils are sometimes objectionable to those who sit beneath them, as in factory offices, where the headroom may be limited, due to their radiation which tends to heat the head and upper portions of the body. On the other hand, under some conditions ceiling coils are especially desirable, as when placed under cold roofs and skylights which are directly exposed, with no intervening space above, in order to prevent the downward flow of cold air. Where cranes, belts and machinery in motion are used, these help to maintain the circulation of air around such coils and distribute the heat throughout the room.

Referring to Fig. 1, the full lines indicate the steam pipe and the dotted lines. the return pipe. The return main should be nearly the same size as the supply main to allow for the cubic contents of the pipe being partially taken up by the steam which, in this system, is maintained with but slight drop in pressure up to the lifting trap. All main supply lines slope 1 inch in 20 feet, and all main return lines slope 1 inch in 15 feet, the direction of flow being shown by the arrows. The supply branches from the mains to the coils slope 1 inch in 3 feet. These should not be too rigid and allowance should be made for expansion and contraction of both piping and pipe coils.

An automatic air valve is placed on the return header opposite its outlet. This is the proper point, as the air settles to the lowest end of the coil which is pitched toward the return. In addition, the pressure and flow of steam from the opposite end aids in the relief of the air.

NEED OF GATE VALVES ON PIPE COILS.

A gate valve is installed on each supply and return branch at the coils to prevent the entrance of steam from either direction, should the coil be valved off for repairs or in accordance with weather conditions, when it may be desired to shut off every other coil. Gate valves should be given preference over globe valves as the latter, due to their interior web or diaphragm which forms an integral part

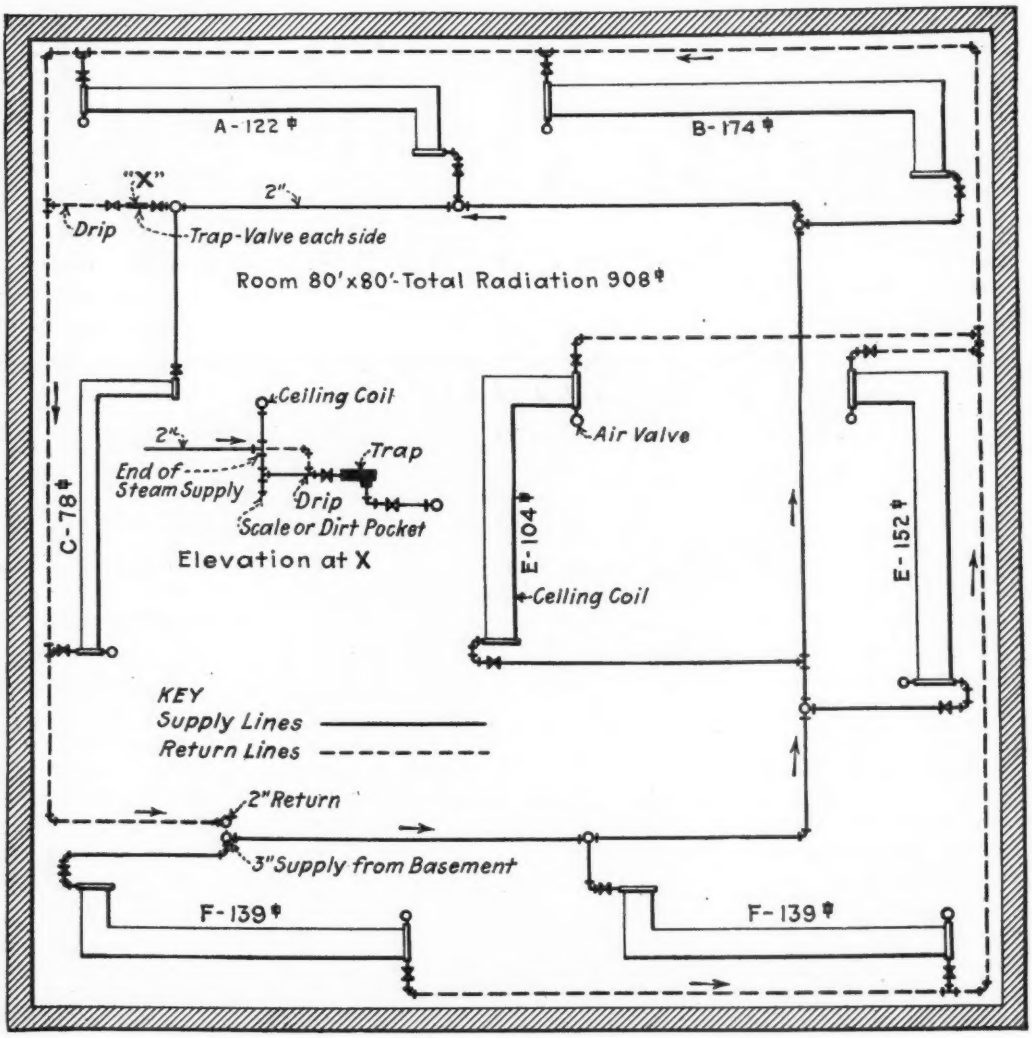


FIG. 1.—FIRST FLOOR PLAN—CORRECT METHOD OF PIPING TO CEILING COILS.

of a globe valve, impede the free drainage of the pipe and retard the condensation until the cross area of the pipe is practically filled. If necessarily used, they should never be set vertically on horizontal pipes, but should be turned through an angle of 90° to lie on their sides. In this position they retain less condensation, but their use is still open to more or less objection, due to water leaking through the packing of the valve bonnets.

Supply branches to coils are connected from the top of the steam main. This prevents condensation from entering the coils. The steam main is continued to supply all coils and with but slight reduction in size to its end just after the last coil supplied, at which point it is dripped to the return through a thermostatic trap

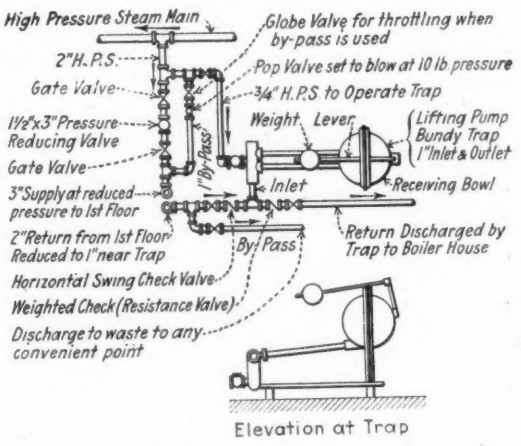

High Pressure Steam Main
Globe Valve for throttling when by-pass is used
2" H.P.S.
Pop Valve set to blow at 10 lb. pressure
Gate Valve
3/4" H.P.S. to Operate Trap
1½"x3" Pressure Reducing Valve
Weight
Lever
Lifting Pump Bundy Trap 1" Inlet & Outlet
Gate Valve
By-Pass
Inlet
Receiving Bowl
3" Supply at reduced pressure to 1st Floor
2" Return from 1st Floor Reduced to 1" near Trap
By-Pass
Return Discharged by Trap to Boiler House
Horizontal Swing Check Valve
Weighted Check (Resistance Valve)
Discharge to waste to any convenient point
Elevation at Trap

FIG. 2.—PLAN OF LIFTING PUMP TRAP, REDUCING VALVE, ETC., IN BASEMENT.

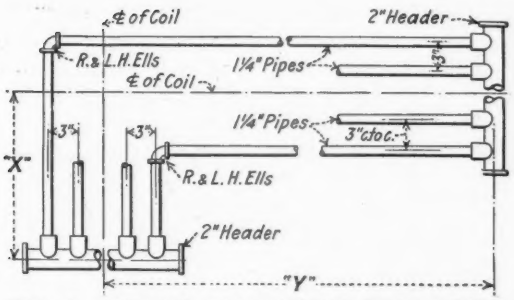


FIG. 3.—DETAIL OF CEILING PIPE COILS.

TABLE FOR USE IN MAKING UP PIPE COILS

Coil	No. Wanted	No. of Pipes	"X"	"Y"	Square Feet Heating Surface
A	1	8	6'-0"	29'-0"	122
B	1	10	8'-0"	32'-0"	174
C	1	6	8'-0"	22'-0"	78
D	1	10	8'-0"	21'-0"	104
E	1	10	8'-0"	27'-0"	152
F	2	10	6'-0"	26'-0"	139
				Total	908

having a shut-off valve at either side to allow for its repair or occasional adjustment. A scale or dirt pocket, consisting of a capped nipple extended vertically downward, is placed before the trap, as shown in Fig. 1. The portion dotted indicates an advisable method of connecting the trap to the end of the main when the distance from the latter to the last ceiling coil which it supplies is slight. Otherwise the condensation may be lifted by the pressure and velocity of the steam up and into the coil. The dotted portion

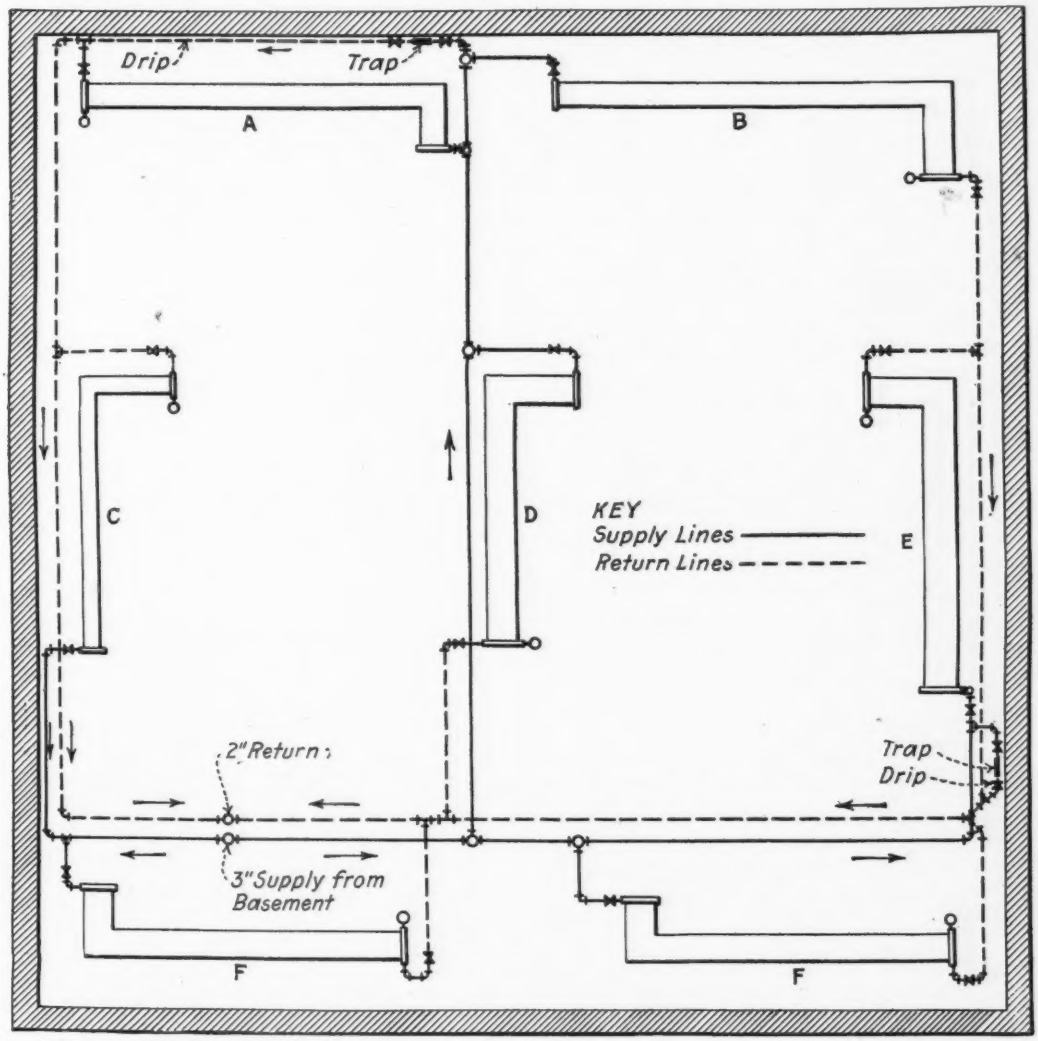


FIG. 4.—FIRST FLOOR PLAN. WRONG METHOD OF PIPING TO CEILING COILS.

should be full size of the steam main and carried 2 ft. beyond the coil before dripping.

STEAM SHOULD BE SUPPLIED THROUGH END OF HEADER ON LONGEST SIDE OF COIL.

Each coil should always be supplied through the end of a header on the longest side of the coil, the return being connected on the same side to the other header. Less short circuiting of the steam through the pipes of the coil is secured than would otherwise be obtained. Furthermore, as each pipe coil pitches downward in the direction of its return end, it follows that the pipe forming the outer and longer side of the coil will be at the lowest point at that end. This, aided by the use of an eccentric fitting or reducing ell connected into the 2 in. return header, allows for the complete drainage of the coil.

WATER HAMMER IN COILS.

Steam rapidly condenses when in contact with the cold water of trapped piping or coils and creates severe concussions as the two bodies of water come together, the resulting vacuum inducing a rapid flow of more steam which slams the condensed steam (water) against elbows, valves, bends, etc., with terrific force or shock. The difficulty may be partially overcome by the use of proper pipe covering which will insure a smaller amount of condensation.

The size of the supply mains should not be reduced too much as the branches are taken off. Friction is much greater in proportion in the smaller sizes of pipes, the ratio of friction surface to volume increasing rapidly. An installation will produce better results if all pipes are one or two sizes large, but very unsatisfactorily, if at all, when they are undersize. Pipe smaller than ¾-in. should not be used either as supply or return piping, for allowance must be made in figuring the required cross area of the pipe, for certain practical conditions, such as inside pipe corrosion, good drainage, pockets, sagging of pipe, mechanical injury, etc. No traps or pockets should be allowed to form where reductions in the size of pipe are made. Eccentric fittings may be used or lines dripped at such points. Pipes should be held firmly in place and prevented from sagging by using substantial hangers.

FIGURING BOILER CAPACITY REQUIRED.

In figuring the necessary boiler capacity required all mains and branches should be counted as radiating surfaces unless thoroughly covered with a good heat insulator. A low pressure steam heating main will give off approximately 2 B. T. U. per square foot per degree of temperature difference between the steam and the surrounding air. In some installations the steam mains are covered, while covering is omitted from the return pipes, as the latter, being at a lower temperature, lose less heat. Furthermore, the return pipes are often installed near the floor (and necessarily so where wall coils are used). In this location their covering is liable to injury.

CONSTRUCTION OF COILS.

A detail of the ceiling coils is shown in Fig. 3. These are constructed with right and left hand ells for the ready removal of pipe lengths, and of the number of pipes located; and are of a length from their longtitudinal centres to the center of the perpendicular spring or expansion piece, as indicated by X and Y in the accompanying table, which also gives the corresponding square feet of heating surface. The supply to the wall coils enters the uppermost header and for this reason the distance X should be limited to the height determined by the accesibility of the supply valve. It should, however, never be less than 8 in., to allow for expansion of the pipes in the coil.

The pipes of the coil are 1¼-in. in size, connecting on 3-in. centers to the two 2-in. headers. The pipes of a ceiling coil are all in the same plane, the resulting increased efficiency allowing the use of coils 8 or 10 pipes wide.

OPERATION OF COILS.

The ceiling coils are supplied by steam reduced from high pressure through the reducing valve located in the basement. As steam is carried at high pressure to each building, it allows the use of smaller pipe from the boiler house or other source up to the entrance of each building, at which points it is reduced as may be required for heating or other purposes. The pressure reducing valve (Fig. 2) is valved either side to allow for repairs, and is by-passed by a line which should always be, in size, one-half the diameter of the inlet to the reducing valve, and pro-

vided with a valve of the globe type, for throttling the high pressure steam by hand should the reducing valve be rendered inoperative. A pop valve, set to blow at 10 lbs. pressure, should be placed on the outlet side of the by-pass to relieve any pressure in excess developed by improper operation of the reducing valve, or by too free a use of the by-pass. As the usual path of the steam is through the reducing valve, the latter is placed in the straight run of the line to avoid any unnecessary turns.

Gauges, one on each side, indicate the two different pressures. These are particularly desirable in connection with the use of the by-pass. Companion flanges or flanged pipe fittings (extra heavy for high pressure steam and standard weight for low pressure having pipes of larger sizes) or unions, where screwed fittings are used, facilitate the removal of the reducing valve for repairs.

The return is reduced at the trap (Fig. 2) to the size of the latter, which is equipped with a by-pass discharging to the atmosphere at any convenient point to a height dependent upon the steam pressure in the heating system at the trap. With this arrangement, the trap may be temporarily removed or valved off for repairs. Necessary unions should be installed for similar reasons. Check and shut-off valves are placed either side of the trap inlet.

In a manufacturing plant where it is desired to measure the condensed steam as a basis of charge for the steam used by different departments, such as drying ovens, glue pots, etc., and for heating, as may be desired by the works accountant, the tilting type of steam trap may be made to serve an additional purpose. Each operation of this trap represents a certain number of pounds of condensation, so that by properly attaching counters to record the operation of the trap, a continuous record of steam consumption for the line to which it is connected may be secured.

EXAMPLE OF IMPROPER DESIGN.

Fig. 4 indicates a method occasionally used for the same type of system as shown in Fig. 1, but the use of this method is invariably followed by poor results in operation, due to short circuiting of the steam through the nearest coil back to and through the return. It has some advantages in that the return and supply lines are shorter in length, consequently there is less condensation to create water hammer, than those shown in Fig. 1. A more economical installation is possible because of smaller and less pipe. Furthermore, the distance below the ceiling is somewhat less, due to the shorter runs.

The return line shown in Fig. 1 continues frm the first coil with a pitch to the end causing it to drop 17 in. in all below the elevation of its starting point. As the latter is also somewhat below the ceiling, the total drop may decrease the available headroom and present a poor appearance along windows or elsewhere. However, the method shown in Fig. 4 is not advisable, particularly for a system in which the steam flows in both the supply and return lines, such as in the one shown. For example, referring to Fig. 4, the steam would flow through its first connection to and through Coil D back to the return and short circuit to the lifting trap, thereby retarding the supply to and the return from all other coils beyond that point. Pressure decreases in accordance with the distance from its source and the friction surface encountered, steam tending to flow through the line of least resistance (usually the shortest distance) to the place of lowest pressure, which in this case exists at the lifting trap. This is particularly noticeable where the pipes are undersize or where in old plants additional radiation, with long horizontal runs, has been added from time to time without an increase in the size of piping. Under these conditions the first radiating surfaces are best, and sometimes the only ones served. In Fig. 1, the flow in the supply and return mains are both in the same direction as shown by the arrows.

For example, Coil F is supplied and its branch return connected to the main return, then Coil E is supplied and its branch return connected to the main return in the order given, and so on until the last coil is served. In Fig. 4, the flow in the two mains is in opposite directions. The method shown by this figure would also involve the use of two traps with necessary valves, piping, etc., for

dripping the ends of supply runs. The branch to the coils F and C could be pitched upward in the direction of the flow. Inasmuch as this run is short the condensation could be allowed to drain back against the flow of steam; by slightly increasing the size of the branch the use of another trap could be avoided.

New Radiation Coefficients

BASED ON THE TESTS MADE BY THE HEATING DEPARTMENT OF THE UNIVERSITY OF LONDON.

Based on tests conducted at the offices of Messrs. John Grundy, Ltd., London, new formulae were submitted at the recent meeting of the (British) Institution of Heating and Ventilating Engineers by Walter Jones. These tests were made during January and February, 1914.

After noting that the heat loss coefficients (K) given by different authorities varied somewhat, it was proposed to adopt the following:

TRANSMISSION TABLE.

				K
Glass	from 1	to 1.09	1	per square foot
Walls (outer)	from 0.14	to 0.37	0.25	per square foot
Walls (inner)	from 0.12	to 0.28	0.17	per square foot
Ceilings, with room above	from 0.17	to 0.35	0.2	per square foot
With roof space above			0.3	per square foot
Floors	from 0.17	to 0.17	0.1	per square foot
Air	from 0.018	to 0.019	0.018	per cubic foot

(Note.—1 B. T. U. will raise 55 cu. ft. of air 1° F., hence 1 B. T. U. ÷ 55 = 0.018 (K) per cubic foot of air.

EMISSION TABLE.

The heat emission from radiators varied from 1.3 to 1.7 B. T. U. per square foot per degree per hour. The emission from plain pipes varied from 1.7 to 2.2. It was proposed to adopt 1.5 B. T. U. as a coefficient.

Window area should include frames and sashes; i.e., wall to wall. Inner wall should be ignored when the room or passage on the other side of it is warmed to approximately the same temperature.

Floors may be ignored when the room below is warmed.

FORMULA NO. 1.

To determine the heat loss, then, from any given building material, the area in square feet (or volume in cubic feet in the case of contents) of the transmitting medium x K = T. For instance, 48 sq. ft. glass x 1 = 48.

As the amount of heat transmitted per unit of surface area depends upon the temperature of the room, the temperature of the outer air and the rate of transmission of the cooling agent, then

$(t_r - t_o)$ K = T for difference in temperature, where

t_r = temperature in degrees F. inside of room.

t_o = temperature in degrees F. outside of room.

T = transmission through cooling agent.

K = coefficient (loss in B. T. U.) per square foot of radiator, etc., per degree per hour.

FORMULA NO. 2.

Let H = the B. T. U. emitted per square foot of radiating surface per degree per hour. The area in square feet of heating surface x H = E, where H equals the coefficient (gain in B. T. U.) per square foot of radiating surface per degree per hour and E the emission of heat from the radiating surface per square foot per degree per hour.

For instance, 32 sq. ft. of radiation x 1.5 = 48.

As in the previous case, the amount of heat emitted per unit of radiating surface depends upon the temperature of the room, the temperature of the heating medium and the rate of emission of the radiator, so that

$(t_w - t_r)$ H = E for the difference in temperature where

t_w = temperature in degrees F. of heating medium,

t_r = temperature in degrees F. inside of room.

Now T (transmission through radiator) = E (emission from radiator). Therefore $(t_r - t_o)\ K = (t_w - t_r)\ H$. Assuming the temperature of the room to be 60° F., the outer air 30° F., the heating medium, water, to be 160° F., and H to be 1.5, then the constant (C) may be obtained by the following formula:

FORMULA NO. 3.

$$\frac{(t_r - t_o)}{(t_w - t_r)\ H} = C \text{ (constant) to cover the losses due to difference in temperature. For instance } \frac{(60 - 30)}{(160 - 60)\ 1.5} = 0.2$$

FORMULA NO. 4.

C (constant) × K = M (multiple) per square foot of glass, etc., to cover all losses. The unit 1 ÷ the multiple (M) Col. 3 = the reciprocal (D) Col. 4 for each medium. For instance:

C	K	M		Reciprocal Divisor (D)
0.2	× 1	= 0.2	per sq. ft. of glass	5
0.2	× 0.25	= 0.05	per sq. ft. of wall (outer)	20
0.2	× 0.17	= 0.34	per sq. ft. of wall (inner)	30
0.2	× 0.2	= 0.04	per sq. ft. of ceiling	25
0.2	× 0.1	= 0.02	per sq. ft. of floor	50
0.2	× 0.018	= 0.0036	per cu. ft. of air (one change)	280

By the use of these formulae, stated the author, one is enabled to obtain quickly, with less liability to error, by a simple sum in multiplication (or division) the amount of radiating surface for each cooling medium, and the total surface required for warming the interior.

He emphasized, however, the need of discretion in providing for the fluctuations in temperature of the heating medium, for north and northeast exposures, altitude, the class of building materials used, construction. etc.

The author then applied the formulae mentioned by Mr. Avery to the room in which the tests were made and compared the calculations and formulae with those shown herewith. As a typical illustration, he took the problem: What amount of radiation is required to obtain 60° F. inside when it is 30° F. outside, with water at 160° F. average temperature, in a room of the following dimensions, assuming the heat emission from the radiator (H) to be 1.5 B.T.U.?

	Area in Square Feet
Glass in windows	48
Door	21
Walls (outer)	252
Walls (inner) 18 in.	180
Walls (inner) 9 in.	159
Ceiling	266
Floor	266
Capacity	2,700 cubic feet × 2 [changes of air.

Working this out according to the Rietschel formula, he obtained the following results:

	Area in square feet		K		B.T.U. per degree		C		Required radiation, square feet
Glass	48	×	1.08	=	52	×	0.2	=	10
Door	21	×	0.25	=	5	×	0.2	=	1
Walls (outer)	252	×	0.28	=	70	×	0.2	=	14
Walls (inner) 18 in.	180	×	0.12	=	21	×	0.2	=	4
Walls (inner) 9 in.	159	×	0.18	=	30	×	0.2	=	6
Ceiling	266	×	0.1	=	26	×	0.2	=	5
Floor	266	×	0.05	=	13	×	0.2	=	2
Interrupted heating		+			61	×	0.2	=	12
Aspect northeast wall		+			8	×	0.2	=	2
Air 2,700 × 2 = 5,400		÷	55	=	98	×	0.2	=	20
Total heat losses					384	×	0.2	=	76

In the foregoing table the coefficient (C) is to cover the losses due to differences in temperature as shown in Formula No. 3. The divisor for air, 55, assumes that 1 B.T.U. will raise 55 cu. ft. of air 1° F.

The author also presented four other examples, one of which was based on Mr. Barker's simplified method, giving 72 sq. ft. of radiation, and one by Prof. Carpenter's formula, giving 56 sq. ft. of radiation. He then calculated the radiation by Formula No. 4, given herewith, and obtained the following result:

	Square feet	M	Required radiation, square feet
Glass	48	×0.2	=10
Wall (outer)	252	×0.05	=13
Wall (inner)	339	×0.034	=11
Ceiling	266	×0.04	=11
Floor	266	×0.02	= 5
Air—cu. ft.	2700×2 changes	×0.0036	=19
		Total	=69

It was explained, however, that the number of air changes for any room—without any special provision for ventilation—was an unknown quantity, and might vary from one to three changes per hour. The losses from transmission were usually in an inverse ratio to the cubic capacity of the room; hence the smaller the room the more generous should be the radiation surface allowance for heat emission, and the judgment of the engineer was a most important factor. He would need to carefully consider the aspect and exposure of each room, the thickness of the walls, the number of doors, the number and size of ventilators (if any), and, assuming that the other co-efficients were used as constants, some elasticity would be required to estimate what amount of heat emission would balance the transmission losses due to air changes.

SUMMARY.

Comparison of the results by the various authorities and formulas.

	Professor Rietschel.	A. H. Barker.	Professor Carpenter.	W. Jones.
Example Nos.	1	2-3	4-5	6-7
Glass losses	10	10	14	10
Outside walls	14	13	19	13
Inside walls	10	8	13	11
Ceiling	5	9	10	11
Floor	2	5	..	5
Door	1	..	..	..
Cubic capacity—air	20	18	..	19
Interrupted heating	12	9	..	..
Exposure	2	..	..	..
Total radiation, square feet	76	72	56	69

A NEW FORMULA BASED ON EQUIVALENT TEMPERATURES.

As bearing further on the same subject, the author referred to a previous paper of his, presented in 1913, in which he stated that the results obtained by a long series of tests did not agree with the theoretical calculations commonly used at that time, and that the higher the required temperature inside the room, the greater the error between the theoretical calculations and the results obtained by actual tests.

He then announced that Roger Preston, a member of the institution, had hit upon an empirical formula that gave, so far as could be judged, "a nearer approach to accuracy than anything yet published for finding equivalent temperatures." It was as follows:

To obtain equivalent (inside) temperatures, from any other assumed (outside) temperatures, calculated throughout in absolute temperatures (zero being 458.4° F.) which figures must in all cases be added to the Fahrenheit thermometer reading:

$$Tc = (Tr^{12} - To^{12} - Ta^{12})^{1\text{-}12}$$

which might be expressed thus:

The 12th power of the *absolute* temperature of room (Tr^{12})

— the 12th power of the *absolute* temperature outside (To^{12})
+ the 12th power of the *absolute* assumed temperature (Ta^{12})
then the 12th root of the result = Equivalent temperature (Tc).

EXAMPLE.

Example: Given the square feet of radiation necessary to obtain 60° F. inside when it is 30° F. outside, what is the calculated temperature when it is zero outside?

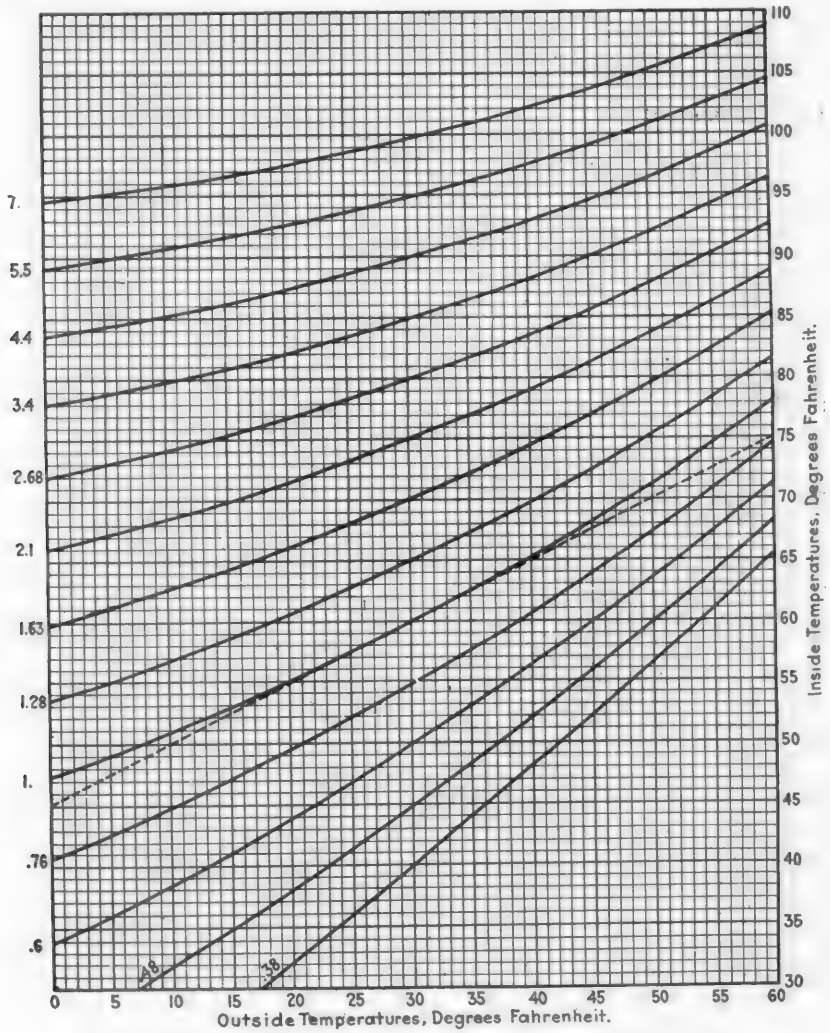


CHART FOR DETERMINING EQUIVALENT INDOOR TEMPERATURES FOR VARIOUS OUTDOOR TEMPERATURES.

	Deg. F.		Absolute Zero Deg F.		Absolute Temperature, Deg. F.
Let Tr = inside temperature	60	+	458.4	=	518.4
Let To = outside temperature	30	+	458.4	=	488.4
Let Ta = outside assumed temperature	0	+	458.4	=	458.4
Then ($518.4^{12} - 488.4^{12} + 458.4^{12}$)				=	505.5

And 505.5—458.4 = 47.1° F., as shown in Table 1, over zero outside temperature.

TABLE A.—EQUIVALENT TEMPERATURES CALCULATED FROM THE PRESTON FORMULA.

(30° F. outside to 60° F. inside is taken as unity, or 1. The equivalent inside temperatures are shown from 40° to 100° F.)

Outside Temperatures, Deg. F.												
0	5	10	15	20	25	**30**	35	40	45	50	55	60
Equivalent Inside Temperatures, Deg. F.												
95	95	96	97	98	99	100	101	102	104	105	107	109
89	90	91	92	93	94	95	96	98	99	101	103	105
83	84	85	86	87	89	90	91	93	95	97	98	101
78	79	80	81	82	83	85	87	88	90	92	94	97
72	73	74	75	77	78	80	82	84	86	88	90	93
66	67	68	70	71	73	75	77	79	81	84	86	89
60	61	63	64	66	68	70	72	74	77	80	82	85
54	55	57	59	61	63	65	67	70	73	76	79	82
47	49	51	53	55	57	**60**	63	65	68	71	75	78
40	42	44	47	49	52	55	58	61	64	67	71	75
33	36	38	41	44	47	50	53	57	60	64	68	72
		32	35	38	41	45	49	52	56	60	64	68
		24	28	32	36	40	44	47	52	57	61	65

In the above table the equivalent temperatures obtained, say, with 69 sq. ft. of radiation are found on the horizontal line, viz., 47° when 0°, 55° when 20°, 65° when 40° and 78° when 60° outside.

Assuming that some other temperature is required in the same room, refer to the chart, and use the multipliers shown at the left, thus 69 ft. × 0.76 to get 40° when 0°, or 69 ft. × 3.4 to get 90° when 45° outside.

In the foregoing table fractions up to 0.5 being of small value, are ignored and those over 0.5 are counted as 1.

It was suggested that the following be accepted as equivalent inside temperatures for the outside temperatures given below:

When outside temperatures (A) are—
20 22 24 26 28 30 32 34 36 38 40
Calculated inside temperatures (H)—
55 56 57 58 59 60 61 62 63 64 65

A Large Combination Steam and Forced Hot Water Heating Plant

NEW YORK STATE REFORMATORY FOR WOMEN, BEDFORD HILLS, N. Y.

Supplementing the description, published last month, of the central hot water heating plant of the New York State Agricultural School, at Farmingdale, L. I., the accompanying article is presented to further illustrate the practice of the State Architect's office in this class of work.

The present description is that of the central heating plant for a reform school for women, located at Bedford Hills, N. Y., known as the New York State Reformatory for Women, the heating plant for which was designed under the direction of Lewis F. Pilcher, State architect, and G. B. Nichols, chief engineer of the Department of Architecture.

This institution consists of two groups of buildings, eight located on the lower campus and certain buildings located on the upper campus. The latter group was increased by four new buildings, known as Cottages 9, 10, 11 and 12, all of which, except the new buildings, were heated from the original power house located at the site of the new power house. The original equipment consisted of a direct-current lighting plant, together with return tubular boilers. The plant, together with the underground heating mains, had long served their usefulness, and were insufficient to take care of the increase in buildings.

It, therefore, was proposed to build a

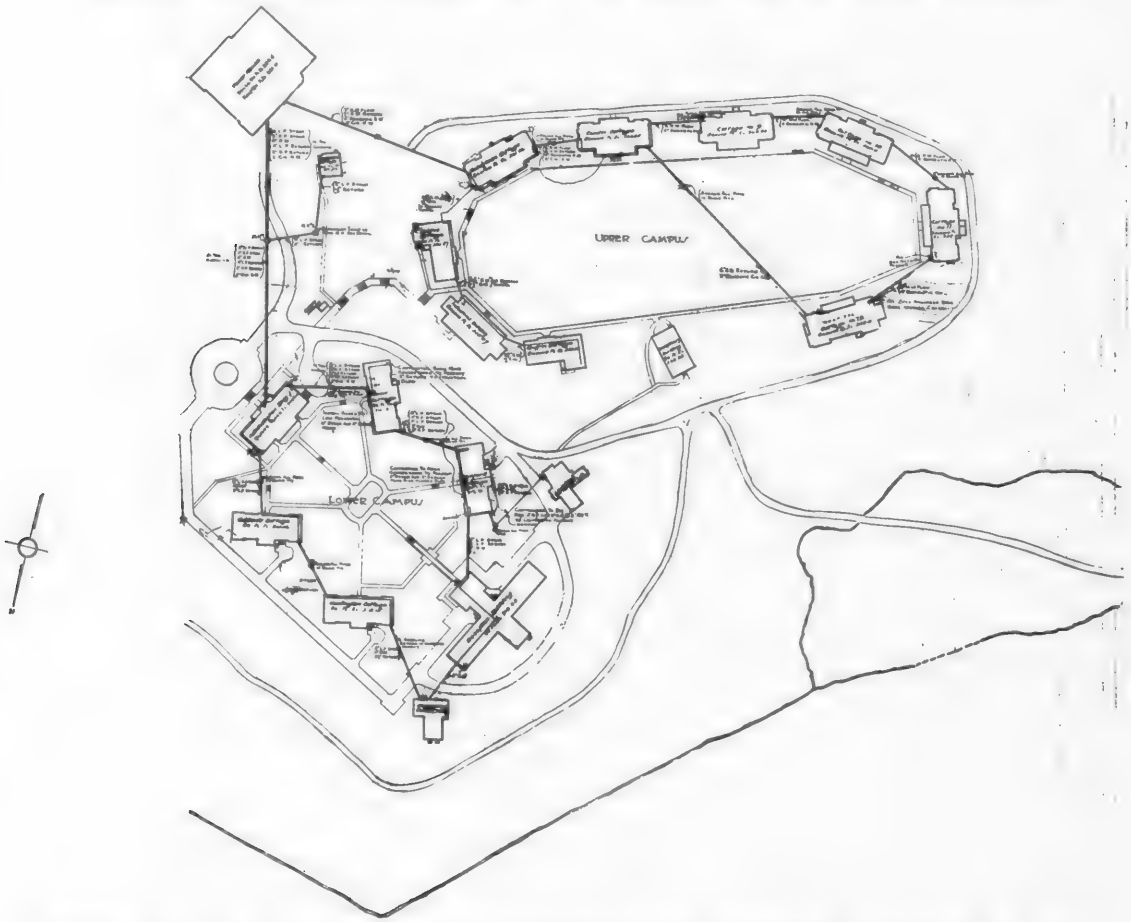
new power house, using such portions of the present power house as was possible and to install new underground heating mains to the various buildings. As the present buildings were all piped for direct and indirect steam gravity return, it was decided to leave all of the lower campus and the buildings in the upper campus, except the new buildings, piped in the same manner, simply installing new underground steam mains to these various buildings.

In Cottages 9, 10, 11 and 12, it was proposed, on account of their arrangement, to install a forced hot water, one-pipe main, heating system, with two-pipe gravity system within the buildings.

On account of the controversy between advocates of the hot water and steam systems, it was decided to carefully meter each heating main leaving the power house, the accompanying block plan showing these heating mains, which are described as follows:

DESCRIPTION OF HEATING MAINS.

From the power house one 10-in. low pressure steam main is carried to the lower campus, with branch to certain of the upper campus buildings for low pressure heating, together with one 3-in. high pressure steam main for laundry purposes.



BLOCK PLAN OF BEDFORD HILLS REFORMATORY, SHOWING LOCATION OF NEW POWER HOUSE, AND UNDERGROUND SERVICE AND HEATING LINES.

One 4-in. domestic hot water and one 2-in. circulating hot water main.

One 4-in. low pressure and one 2-in. high pressure steam return.

This group of mains was installed from the power house to the Administration Building in two split tile conduits, at which point the mains divided, passing through the various buildings in the group and connecting to the present steam mains in the basement of each building.

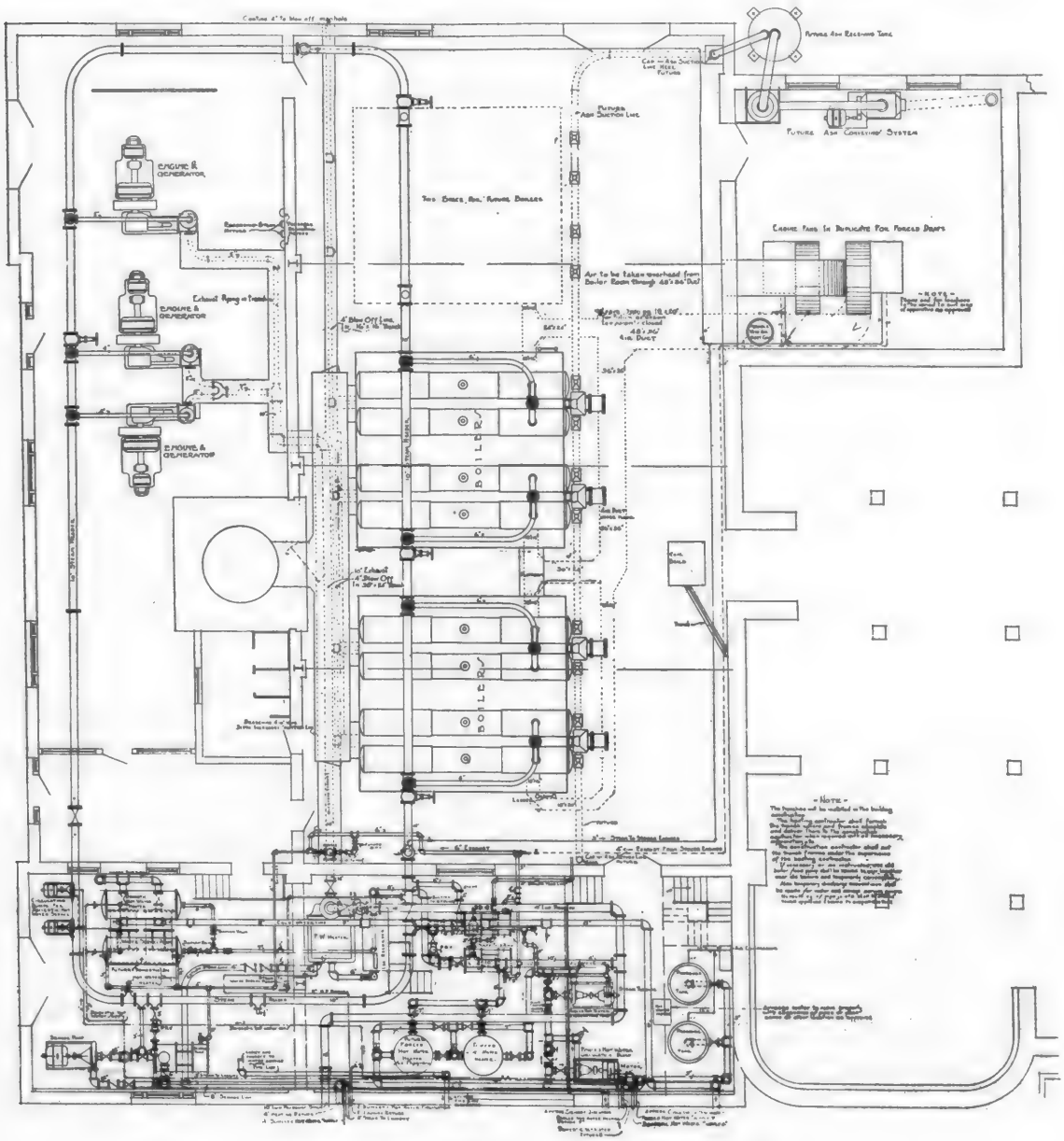
Originally the laundry, located in the

lower campus, was provided with a separate boiler for high pressure steam, which, under the new arrangement, was abandoned, as it is proposed to heat the building and furnish live steam and hot water from the new power house.

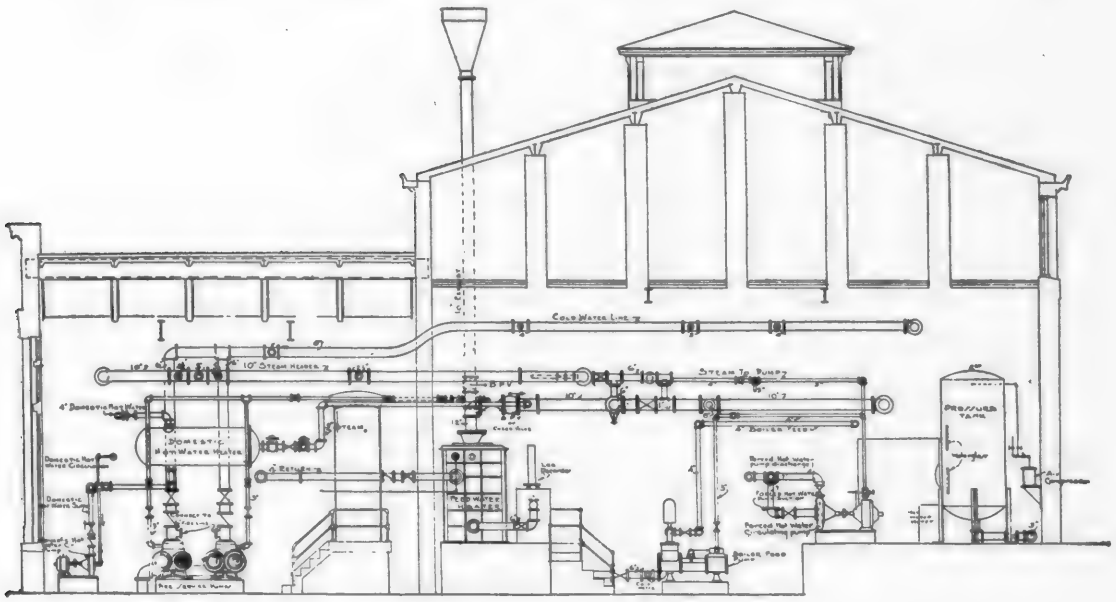
Leaving the power house there was also installed to the upper campus one 7-in. flow hot water heating main with 7-in. return main, together with a 4-in. domestic hot water main with 2-in. circulating main, all run in a split tile conduit to Robertson Cottage and thence to Cowdin Cottage, where the mains divided, forming a loop through Cottages 9, 10, 11 and 12.

The original buildings on the upper campus were left connected by the present underground steam mains at manhole No. 2 near engineer's cottage.

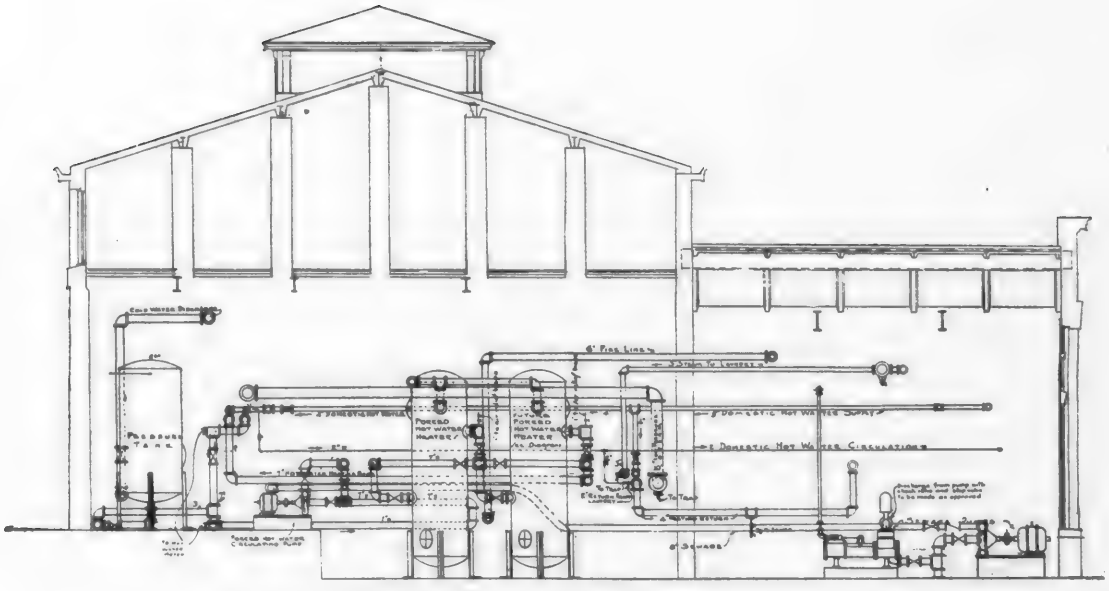
On account of the new plant being built at the site of the old plant, consid-



FIRST FLOOR PLAN OF POWER HOUSE.



SECTION THROUGH PUMP ROOM, LOOKING TOWARDS BOILER ROOM.



SECTION THROUGH PUMP ROOM, LOOKING AWAY FROM BOILER ROOM.

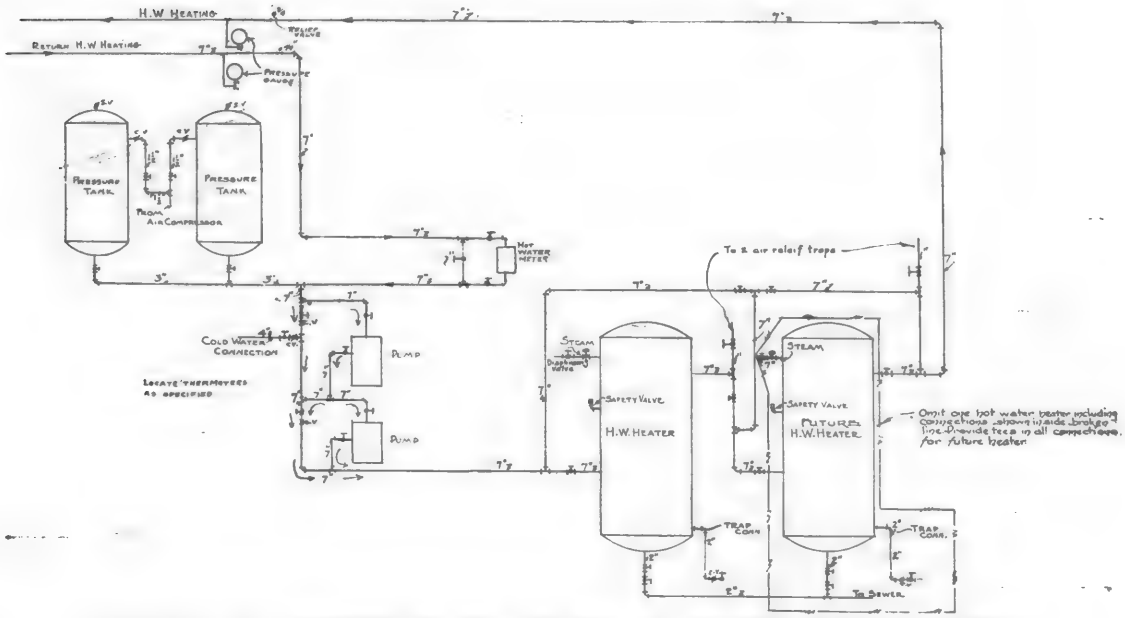


DIAGRAM OF CONNECTIONS FOR FORCED HOT WATER HEATING SYSTEM.

erable difficulty was encountered in keeping the original system in operation while the new building was being constructed directly around the old apparatus, especially as a great deal of this work was carried out during the winter time. By careful forethought, however, this has been accomplished.

The total equivalent direct radiation for the institution is as follows:

Original buildings to be supplied by steam, approximately 35,000 sq. ft. of equivalent direct radiation.

New buildings to be supplied by hot water, approximately 12,500 sq. ft. of equivalent direct radiation.

The design, however, is to provide for approximately 30,000 sq. ft. of radiation connected to the forced hot water heating system and approximately 40,000 sq. ft. of direct radiation for steam service.

ARRANGEMENT OF BOILER HOUSE.

The boiler house consists of a brick building with asbestos roof and so designed that coal can be delivered directly from auto truck to the coal pocket. All

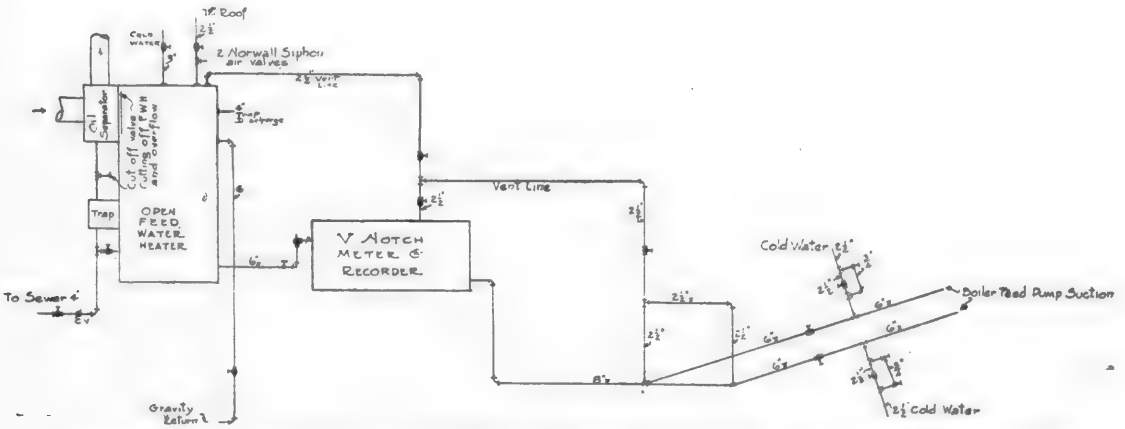


DIAGRAM OF CONNECTIONS BETWEEN FEED WATER HEATER AND FEED PUMPS, ETC.

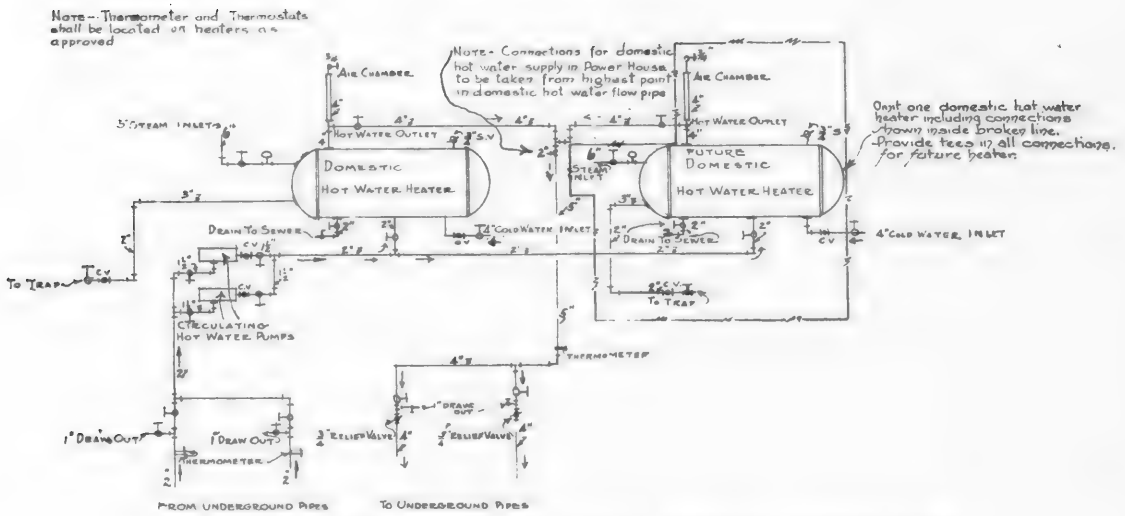
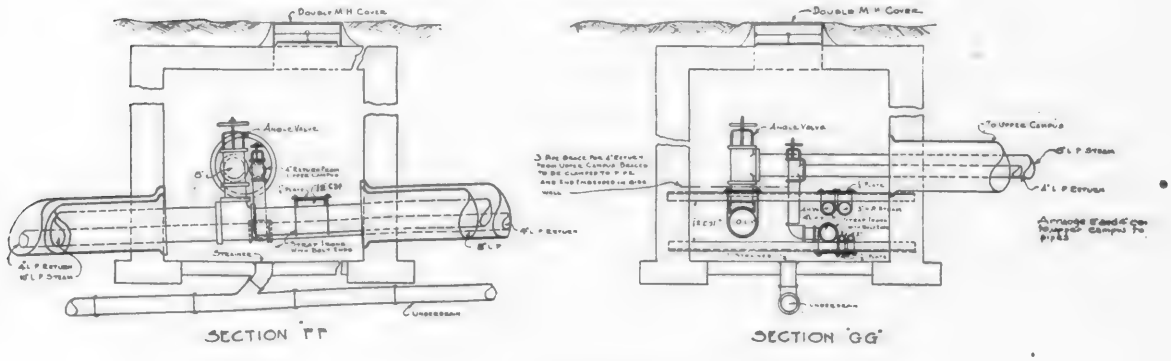
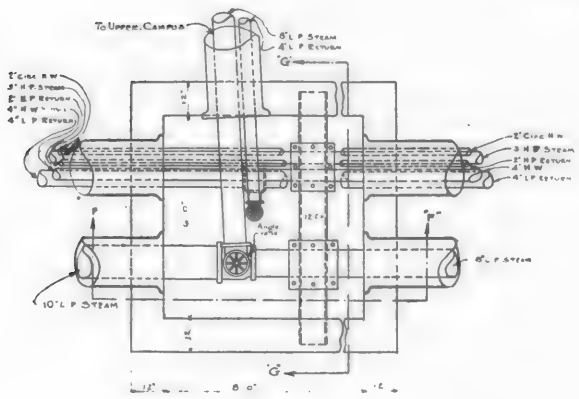

Note - Thermometer and Thermostats shall be located on heaters as approved
Note - Connections for domestic hot water supply in Power House to be taken from highest point in domestic hot water flow pipe
Omit one domestic hot water heater including connections shown inside broken line. Provide feed to all connections for future heater.
AIR CHAMBER
HOT WATER OUTLET
DOMESTIC HOT WATER HEATER
FUTURE DOMESTIC HOT WATER HEATER
STEAM INLET
DRAIN TO SEWER
4" COLD WATER INLET
TO TRAP
CIRCULATING HOT WATER PUMPS
THERMOMETER
1" DRAW OUT
3/4" RELIEF VALVE
4" RELIEF VALVE
FROM UNDERGROUND PIPES
TO UNDERGROUND PIPES

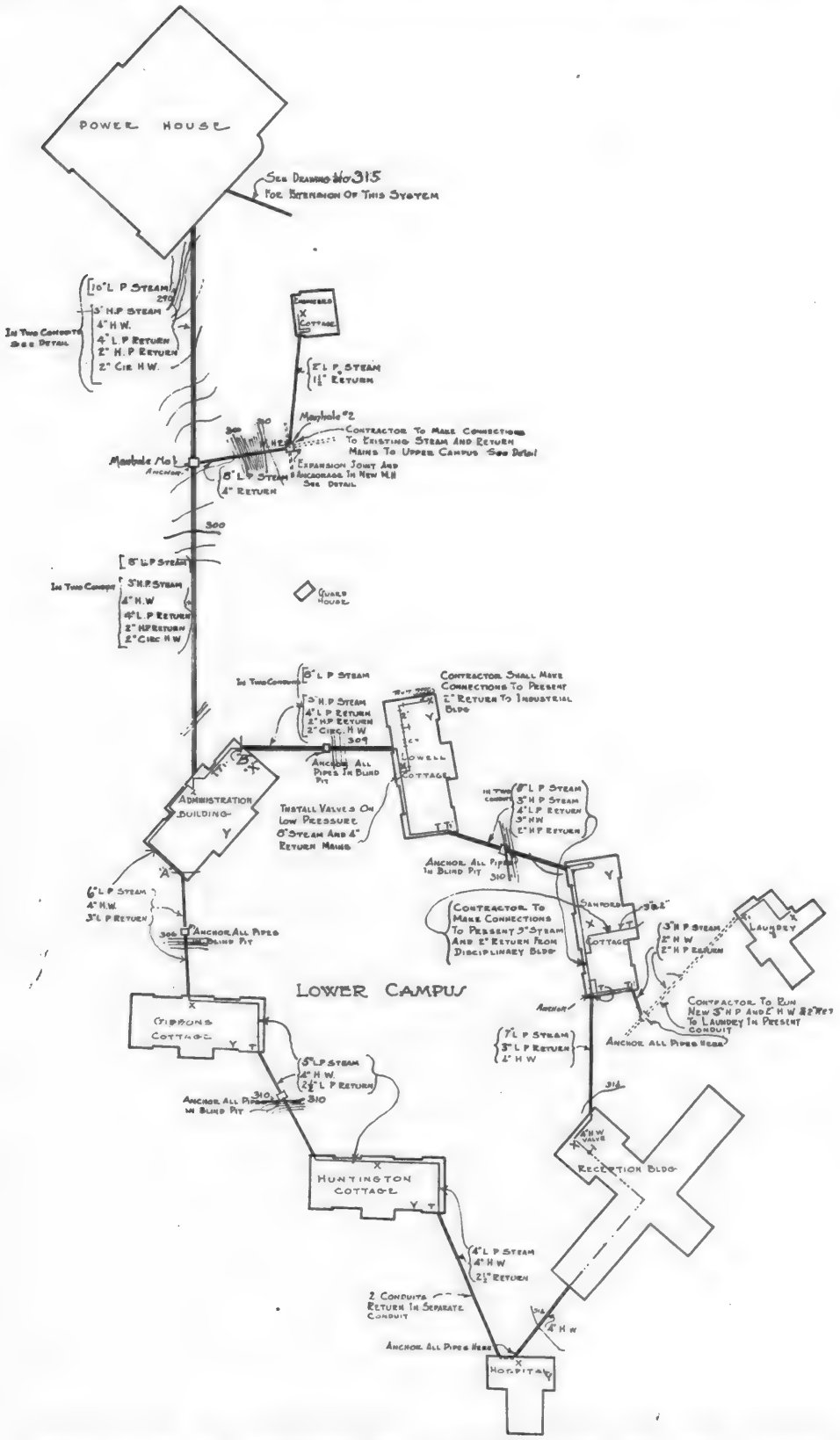
DIAGRAM OF DOMESTIC HOT WATER HEATER CONNECTIONS.



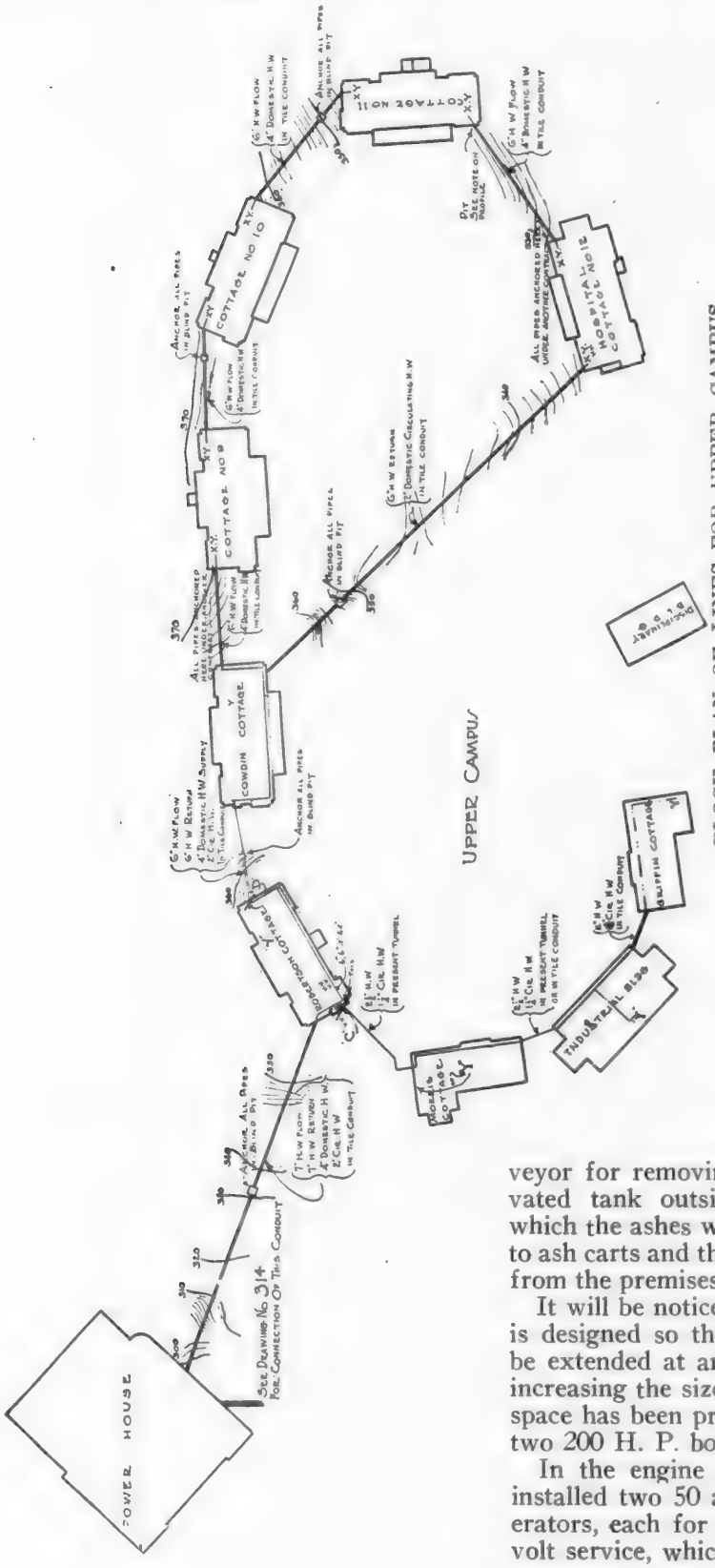
DETAIL OF ANCHORAGE CONNECTIONS
AT MANHOLE NO 1
SCALE 1/2" = 1'-0"



DETAIL OF ANCHORAGE CONNECTIONS AT MANHOLE NO. 1.



BLOCK PLAN OF UNDERGROUND CONDUIT LINES FOR THE LOWER CAMPUS.


UPPER CAMPUS
COTTAGE NO 1
COTTAGE NO 10
COTTAGE NO 9
COTTAGE Y
COWDIN COTTAGE
GRIFFIN COTTAGE
INDUSTRIAL BLDG
POWER HOUSE
HOSPITAL NO 12 COTTAGE
ANCHOR ALL PIPES IN BLIND PIT
ALL PIPES ANCHORED UNDER ANOTHER CONTRACT
6" H.W. FLOW 4" DOMESTIC H.W. IN TILE CONDUIT
6" H.W. RETURN 4" DOMESTIC CIRCULATING H.W. IN TILE CONDUIT
6" H.W. RETURN 4" DOMESTIC H.W. 2" CIR. H.W. IN TILE CONDUIT
1" H.W. FLOW 1" H.W. RETURN 2" DOMESTIC H.W. 2" CIR. H.W. IN TILE CONDUIT
2" CIR. H.W. IN PRESENT TUNNEL
2" CIR. H.W. IN PRESENT TUNNEL OR IN TILE CONDUIT
2" CIR. H.W. IN TILE CONDUIT
PIT SEE NOTE ON PROFILE
See Drawing No 314 For Connection Of This Conduit

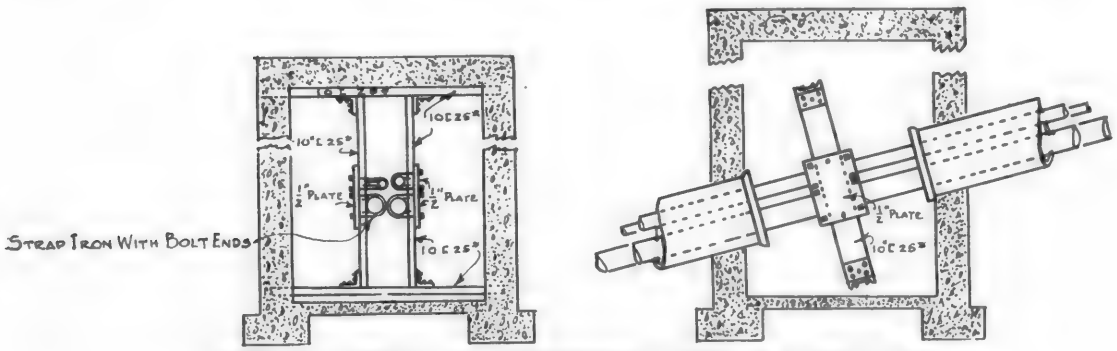
BLOCK PLAN OF LINES FOR UPPER CAMPUS.

of the equipment is now installed and is operating satisfactorily, and it is hoped that a considerable amount of data will be obtained during the coming winter in reference to steam and hot water heating, so as to make a comparison of the two systems under the same conditions, as most of the buildings are of the same general character of construction.

The boiler plant consists of four 200 H. P. McNaull non-sectional, water-tube boilers, with red faced brick settings. The top of the boilers has been leveled off smooth with a filling of cinders, over which there has been placed a layer of concrete, making an absolutely smooth surface on the top of the boilers. All of the boilers are furnished with Jones underfeed stokers and the plant is now burning bituminous coal. It is proposed in the future to install a suction ash conveyor for removing the ashes to an elevated tank outside the building from which the ashes will be delivered directly to ash carts and the same will be removed from the premises.

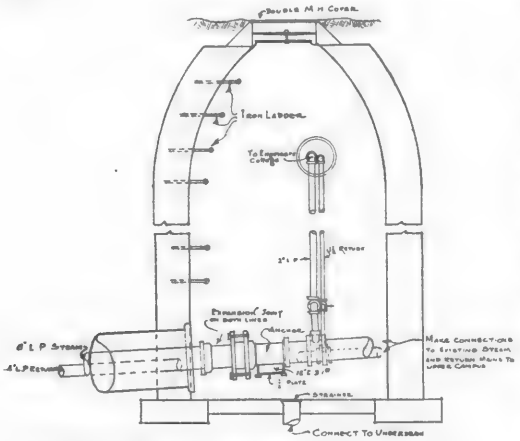
It will be noticed that the boiler house is designed so that the boiler room can be extended at any future date, thereby increasing the size of the plant, although space has been provided for a battery of two 200 H. P. boilers.

In the engine room there have been installed two 50 and one 75 K. W. generators, each for 3-phase, 60 cycle, 2300 volt service, which generators are of the

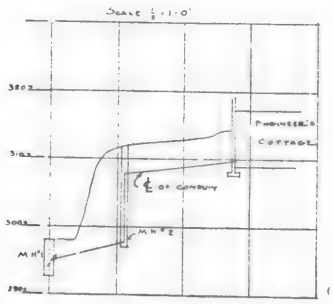


TYPICAL METHOD OF ANCHORING PIPES IN BLIND PITS.

Ft. Wayne Electric Company's make, together with the switchboard. Each generator is direct connected to a high speed engine of the Ball Engine Company's make, together with a direct connected exciter. There has also been installed in the engine room one constant current transformer for supplying a series incandescent ground lighting system, which lights are located throughout the institution.



SECTION THROUGH MANHOLE NO. 2.



ELEVATION
BETWEEN MANHOLE NO 1 AND MANHOLE NO 2
AND ENGINEER'S COTTAGE

ELEVATION BETWEEN MANHOLE NO. 1 AND MANHOLE NO. 2 AND ENGINEER'S COTTAGE.

It will be noticed that there has been installed a 10-in. steam header circling the entire power house, making it possible to repair any portion of same and still keep service in operation.

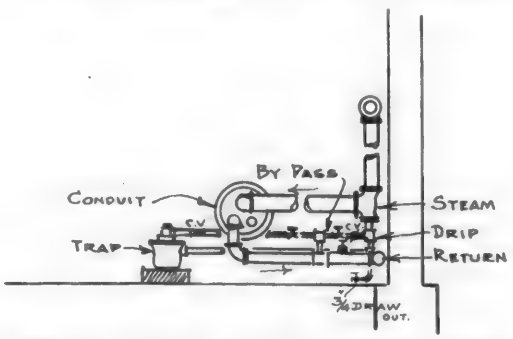
The chimney has been installed directly in the center of the power house, and is 7 ft. in diameter by 150 ft. high.

EQUIPMENT OF PUMP ROOM.

In the pump room there has been installed the following apparatus:

Two forced hot water heaters, each heater being 54 in. in diameter by 14 ft. high and containing 150 2-in. tubes, each tube being 7 ft. long, spaced on 3 ¼-in. centers, making a total of 555 sq. ft. of heating surface for each heater. These heaters are to be used in connection with heating the water for the forced hot water heating system and so arranged that either heater can be supplied with low pressure steam.

In connection with the forced hot water heating system, there have been installed two forced hot water circulating pumps, one pump being motor-driven and the other steam turbine driven, the use of same depending on the electric load at



TYPICAL DETAIL OF TRAP CONNECTIONS FOR NEW LOW PRESSURE STEAM MAINS AT POINTS OF LEAVING BUILDINGS.

the time of operation. The pumps are connected so as to operate individually or in series, depending on the demands for heating service. The pumps were furnished by the Gould Manufacturing Company.

In connection with the forced hot water heating, there have been installed two expansion tanks, each tank being 5 ft. in diameter by 10 ft. high, the air cushion on the top of same being maintained by one Westinghouse air compressor mounted on the wall near tanks.

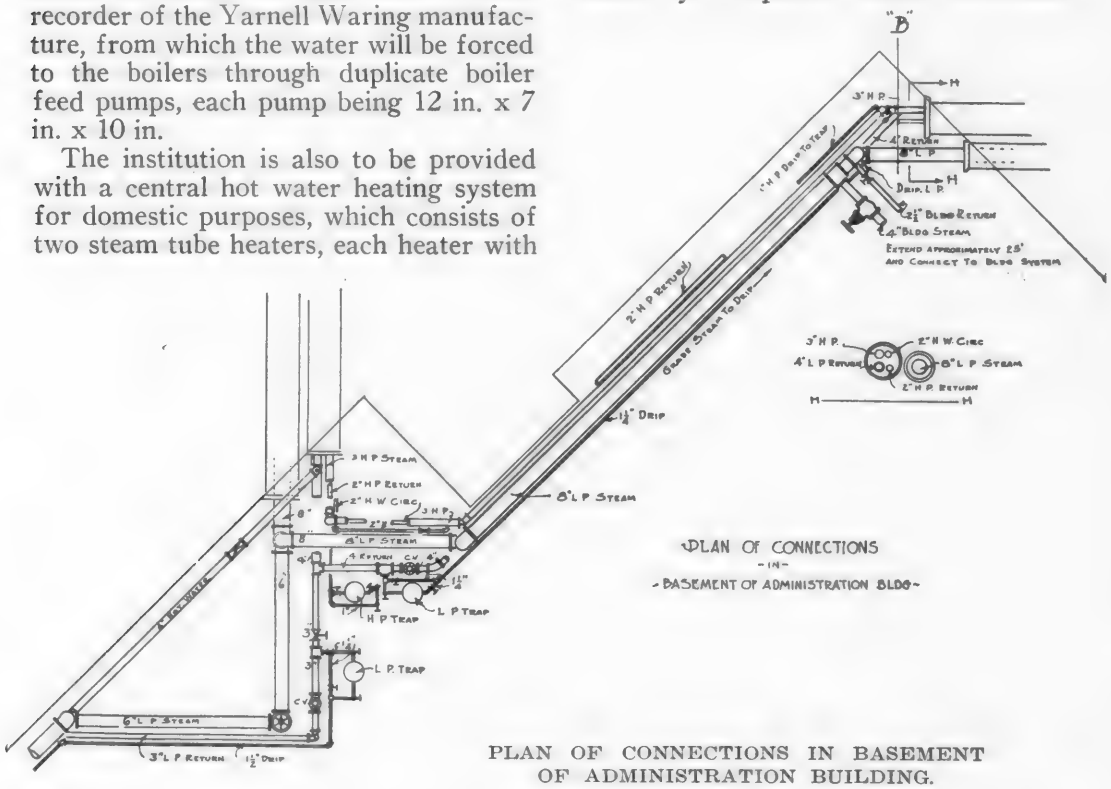
All of the returns from the heaters and buildings will be delivered to an open feed water heater of the Webster type, which will deliver the water to a V-Notch recorder of the Yarnell Waring manufacture, from which the water will be forced to the boilers through duplicate boiler feed pumps, each pump being 12 in. x 7 in. x 10 in.

The institution is also to be provided with a central hot water heating system for domestic purposes, which consists of two steam tube heaters, each heater with a capacity of heating 4,000 gals. of water per hour.

For maintaining circulation there have been installed two centrifugal pumps, each capable of discharging 40 gals. of water per minute against a head of 10 lbs. per sq. in. and direct connected to a one H. P. electric motor.

There has also been installed in the pump room two water pumps for pumping water from a large open well located near the power house directly to an overhead steel tower tank located at the highest point of the institution for supplying the water for the buildings.

Located a half a mile from the buildings already mentioned is a separate group of four buildings similar to the four new buildings having just been built on the upper campus for cases requiring isolation. This group of buildings is heated by a separate forced hot water heating plant located in the basement of one of the main buildings and it is believed that this also will furnish data regarding central heating as compared with buildings heated by a local plant.



PLAN OF CONNECTIONS
-IN-
-BASEMENT OF ADMINISTRATION BLDG-

PLAN OF CONNECTIONS IN BASEMENT OF ADMINISTRATION BUILDING.

THE HEATING AND VENTILATING MAGAZINE

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AN ADDRESS that has a direct bearing on the plans now under way to provide additional opportunities for the education of the heating and ventilating engineer was delivered recently before the Cleveland Engineering Society by Professor John R. Allen. Coming from a past president of the heating engineers' society, his remarks are quite timely. One of the interesting points brought out was that of the graduates in mechanical engineering at the University of Michigan who have been out ten years or more, 90 per cent. are still in engineering; 34 per cent. are presidents, vice-presidents, general managers, or general superintendents of manufacturing corporations; 39 per cent. are superintendents, chief engineers or sales managers of manufacturing corporations; 7 per cent. are constructing engineers, professors, patent attorneys and in special lines; while 20 per cent. are salesmen, in minor positions or in other lines. In other words, the statistics show that almost 80 per cent. make good and reach positions of responsibility, and the speaker well asks, "What community of untrained men can show such a percentage of success?"

Another point emphasized in the address was the criticism that the American engineer is apt to be superficial. In this connection, we believe the following remarks on this topic, made in the course of the discussion of Prof. Allen's address, fairly express the situation and will be a reassurance to many who have, perhaps, envied the thoroughness of the best type of European engineer:

"Because I was raised and educated abroad," said this engineer, "I wish to thank the speaker for his flattering remarks about the thoroughness of the European engineer. However, I think that, on the whole, there is not a great deal of difference, except possibly in the training in mathematics, the European engineer being usually a better mathematician than his American brother. Otherwise, I should be inclined to favor the American methods. * * * Where the European engineer is usually handicapped is in his ability as a business man. His mind is inclined to travel in a narrow groove of technicalities and he often lacks the broad and cheerful outlook on life common to the natives of this country. The reason for this difference, I find, is in the American interest in outdoor sports. Having spent a great deal of his time on the football field or on the tennis court, the young American becomes a mixer, learns to know how the other fellow thinks and feels, and gets the knack of rubbing shoulders with the world at large without getting an elbow in his ribs.

"The European engineer, on the contrary, is usually an indoor man, trained to become a professor in due season, and taught to keep his nose to the grindstone."

THE CONSULTING ENGINEER

The Consulting Engineer" is prepared to reply, in this department, to any questions which our readers may ask regarding problems connected with the design and installation of mechanical equipments of buildings.

CONDUCTED BY IRA N. EVANS, C. E.

54—Simple Remedy for Noisy Heating System.

QUESTION: I have a single pipe steam heating system connected as shown in the sketch with the full lines. The job works all right on about 3 lbs. pressure at the reducing valve, but the radiators hang up with water and air, making a noise when the pressure is raised above the point named.

We are, of course, aware that the horizontal pipe connections between the risers and radiators are too small and too long. Can you suggest any cheap method of assisting the circulation? We thought of running a system of air lines, with connections, to each air valve and using steam ejectors to exhaust the air from the radiators.

The returns now connect a pump governor and are then pumped back to the boiler. Live steam only is used for heating.

ANSWER: Connecting to the air valves with an air line will not help matters, as the reason the radiators do not work now is due to the lower pressure in the radiator than in the riser, causing the water to make a noise in the radiator. The following is suggested: Put on new air valves of the Jenkins type, with drip. Connect a ⅜-in. pipe to the plug on the return end of each radiator, with a 2-in. or 1½-in. outlet and 1-in. on the run, or a 1-in.x1-in.x2-in. tee connecting one outlet to the air valve and the other to the ⅜-in. return, with a small brass strainer in the tee.

Bring the ⅜-in. return to the riser separate with a ⅜-in. check on a drop leg at the point of the supply risers.

Arrange all floors the same and run a new ¾-in. line to the basement, all as shown in sketch, the dotted lines showing the new work. The new line runs alongside each supply riser.

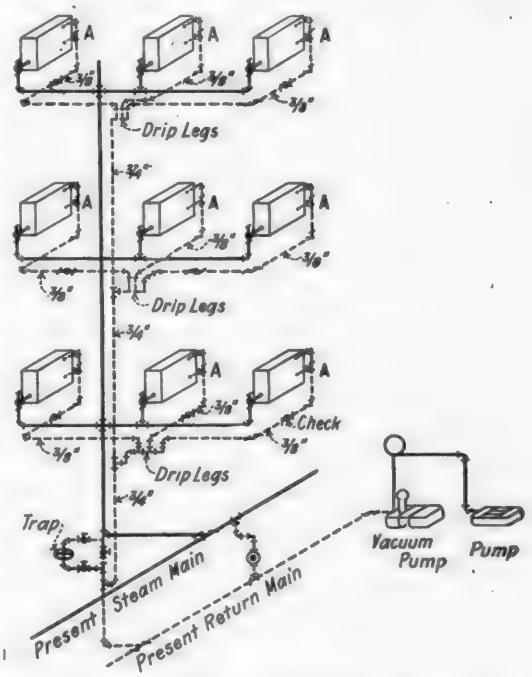
Where the regular drip occurs at the base of each riser, cut in a Dunham or Heintz expansion trap, with by-pass. Carry a new ¾-in. line to a point below the trap and by-pass and connect it in the same drip line, all as shown.

Where drips are necessary on the first floor or basement, these connections should be made to the return through separate traps into present existing return line.

On the end of the present return line place a vacuum pump of the Marsh type and pump air and water into a small overhead air tank. The tank can then be drained to present pump governor and the water passed to the boiler in the same manner as at present.

All dotted lines represent new work and full lines old. Only one riser is shown, but as many as desired may be treated in this manner.

This will enable the job to be operated



SKETCH OF SIMPLE REMEDY FOR NOISY HEATING SYSTEM.

with a vacuum on the return and the air and water can be removed.

When any radiator tends to hang up the water will accumulate in the ⅜-in. returns, forming a solid column which will produce its own vacuum at each riser.

In case there is no water present in the return line the radiator will be operating properly.

The additional connection from the air valve to the return line is not absolutely necessary, but the vacuum on the return will remove any air and prevent any disagreeable drip or leak.

The principle on which each line works is that of the steam loop. The radiator forms the cooling surface at the top of the line and the ¾-in. riser, with its column of water, balances the difference in pressure between the riser and radiator with something to spare.

This only requires one trap for each riser, instead of one for each radiator. There should be, however, 20 ft. between the lowest radiator and the point of connection to the return drip.

The present basement return line can be used without change and there are practically no horizontal runs except the run-outs from the ¾-in. riser to the individual radiators.

This makes a cheap and efficient method of making a badly piped single pipe system work.

55—Meeeting Indoor Humidity Requirements.

QUESTION: The statement has frequently been made that where air conditioning is employed, the temperature of the air supply may be reduced thereby, lessening the cost of heating. Is this true?

ANSWER: It is not. On account of the evaporation of the water to condition the entering air the expense is considerably increased, even when the temperature of the room is lowered.

We will assume for the discussion 1,000 cu. ft. of air, entering at 0°, at 32° and 25% relative humidity and raised to 65° and 70°, with 45% to 50% relative humidity, and calculate the B.T.U. required for the moisture and dry air.

Below 32° there is practically no moisture in the air, or very little, due to the fact that is below freezing.

The following shows the initial and terminal requirements.

Th table indicates that in all heating weather practically 3 grains of moisture per cu. ft. will have to be added, so this figure will be used in the calculations.

Temperature Outside Air Deg. F.	Relative Humidity, Per Cent.	Grains Moisture per cu. ft.		Grains Moisture per cu. ft. Inside Air.	Grains Moisture To be added, per cu. ft.
0	25	0.2	70° F. 40%	3.25	3.05
30	20	0.4	70° F. 50%	4.0	3.6
40	40	1.0	70° F. 40%	4	3.0

In practice the heat for the room to provide for leakage and radiation may require the air supply to be raised to 120° or some other figure, but this will not affect the final result as when this heat is dissipated to the outside through the walls of the rooms the normal temperature of 65° or 70° obtains and the proper degree of humidity.

The heat required to raise the temperature of the water vapor after the latent heat of evaporation is provided is very little or less than 0.6 of a B.T.U. per pound per degree raise in temperature.

The specific heat of air is 0.2375 and we will assume a weight of 0.075 lbs. per cubic foot of air at approximately 70° F. The heat required to raise the dry air from 0° to 70° F. for 1,000 cu. ft. will be 1,000x 0.075x0.2375x70 = 1,247 B.T.U.

The heat required to raise the vapor of the incoming air to 70° will be as follows: Assuming an average of 0.2 grains per cubic foot, and a specific heat of 0.47 and 7,000 grains to the pound.

$$\frac{0.2 \times 1{,}000}{7{,}000} \times 0.47 \times 70 = 9.4 \text{ B.T.U.}$$

The heat required for the vapor of the incoming air is practically negligible in amount. The heat required to vaporize 3 grains of moisture per cubic foot will be as follows: The latent heat of evaporization at 70° F. is 1,052 B.T.U. per pound. Then

$$\frac{1{,}000 \times 3 \text{ gr.}}{7{,}000} \times 1{,}052 = 451 \text{ B.T.U. per 1,000 cu. ft.}$$

or about one-third of the amount necessary to raise the dry air to 70° from 0°.

Suppose the air enters at 65° instead of 70°, with air conditioning as against 70° without. The air would require $\frac{13}{14} \times$ 1,247, or 1,158 B.T.U. 1,158 B.T.U. + 451 B.T.U. = 1,609 B.T.U., as against 1,247, or approximately 30% more heat—than if the air was simply raised to 70° without conditioning.

The actual amount of water required in a building requiring 120,000 cu. ft. of air per hour would be

$\frac{3{,}000}{7{,}000} \times 20 \times 60 = 516$ lbs. steam per hour, or 15 boiler horse-power at 34.5 lbs. Almost 8¼ cu. ft. per hour or 62 gal. per hour during freezing weather.

The above figures show that conditioning air is costly, not that the expense may not be warranted.

The horse-power to raise the air from 0° to 70° F. would be $\frac{1{,}247 \times 60 \times 20\ M}{33{,}000} = 45$ boiler H.P.

LEGAL DECISIONS

When Meter Rate for Steam Heat Is Preferable to Flat Rate.

In an application by an electric company to withdraw flat rates for steam heating service at DeKalb, Ill., it appeared that the steam heating service there is operated in conjunction with the electric generating plant, thereby allowing of the utilization of the exhaust steam from the prime movers. This steam is carried through insulated underground pipes into the consumers' premises, and condensed in the radiators. The measure of the cost of service has been made in the past in two ways: (1) on the amount of radiation installed, and (2) on the amount of steam condensed in the consumers' premises as measured by the water of condensation. The object of the petition was to eliminate the flat rate charge from the schedule, and to place all consumers on the meter basis. The application was granted, it appearing that the meter rate was more just to both the consumer and the utility than the flat rate, which leads to excessive use and waste of steam.—*In re* DeKalb-Syracuse Electric Co.

Breach of Warranty—Counterclaim.

Action was brought for an alleged breach of warranty respecting a heating plant installed in the plaintiff's residence. The defendants alleged acceptance and counterclaimed for a balance due on a completed contract for furnishing and installing new boilers and connections in place of existing ones, the same to be accepted in full satisfaction of any claim the plaintiff had in respect of breach of warranty. One of the defendants testified that the amount of material furnished under the secondary contract was $468.44; that the time to be charged for was 391 hours; that the plaintiff was to pay all freight and cartage bills, and that the balance due was $163.94. In the absence of evidence to the contrary it was held that there was nothing to do but find for the defendants.—Boutin vs. Andreas, Wisconsin Supreme Court, 152 N. W. 822.

Safe Place to Work.

In a steam fitter's action for injuries received while walking through a passageway in the defendant employer's establishment to a room in which he was at work, it appeared that he was injured by bales thrown down by laborers employed in the same establishment, who neglected to warn him or to comply with the defendant's order to place in the passage warning signs provided for just such an occasion. The Pennsylvania Supreme Court held that a verdict was properly directed for the defendant.—Larsen vs. John T. Bailey Co. (Pa.), 94 Atl. 1057.

Water Heater Patents.

The federal district court, W. D. Pennsylvania, holds that the Shook patent, No. 993,723, for an instantaneous gas water heater, the essential feature of which is the use of a single gas valve in combination with thermostatic controling means, is void, on the ground that the patentee was not the original and first inventor of such feature, which is disclosed in the Walker patent, No. 896,100.—Pittsburgh Water Heater Co. vs. Beler Water Heater Co., 222 Fed. 950.

Owner's Liability to Contractor for Delays.

Under contract with a county, a company installed heating and ventilating, plumbing and other systems in a public building. Delays were occasioned the company by the failure of other contractors to keep abreast of the work, and the company sued the county for damages under the contract on account of such delay. The contract provided in one article that if the contractor should be delayed in the prosecution or completion of the work by the act, neglect, or default of the owner, architects, or any other contractor employed by the owner on the work, the time fixed for the completion of the work should be extended for a period equivalent to the time lost by such delay; and the next article provided that the owner agreed to provide all labor and materials essential to the conduct of the work, not included in the contract, in such maner as not to delay the progress of the work, and in the event of failure so to do, thereby causing loss to the contractor, the owner should reimburse the contractor. It was held that the clause in the latter article

requiring the owner to provide labor and materials referred only to such labor and materials as the owner himself was required to furnish, and did not render the owner liable for delay to the contractor caused by delay in the work being done by other contractors. As the parties expressly provided for delays through two different causes, nothing could be implied different from that which was expressed by the language employed.—W. G. Cornell Co. vs. Schuylkill County, C. C. A., 222 Fed., 876.

Installing Mechanical Equipment with Limited Facilities.

Some of the conditions actually encountered in connection with the delivery and setting up of apparatus for the Chinese Government Bureau of Engraving and Printing, in Peking, China, are illustrated in the accompanying views which were taken, during the progress of the work, by R. D. Hopkins, the engineer in charge. These views refer to such interesting details as handling and setting up the boilers, hauling in the heaters, sinking well tubes and erecting engines and dynamos.

Fig. 1 shows two 250-H.P. Babcock & Wilcox water-tube boilers in course of erection. Including foundations the boilers were erected entirely by Chinese labor under Mr. Hopkins's direction. This type of boiler, especially for foreign countries, is shipped completely knocked-down, and the

FIG. 1.—TWO 250-H.P. BABCOCK & WILCOX BOILERS IN COURSE OF ERECTION IN PEKING CHINA.

considerable care and accuracy in their work, and when fully erected there were extremely few leaks in the tube heads.

The entire brick work was built up in the usual manner, using native fire brick for linings, bridge walls and paving wash-pits. The common brick were also native made and are as a rule much softer than our ordinary brick, being gray in color.

HAULING OF MACHINERY.

Some difficulty was experienced in hauling some large pieces of machinery through

FIG. 2.—METHOD USED TO HAUL 5-TON I. B. DAVIS COMPANY BERRYMAN HEATER.

problem of forming up the sections and expanding the tubes at the right angle is somewhat difficult to one not specially trained in this particular work. However, as soon as the mechanics had built up two or three of these sections they displayed

the streets of Peking for a distance of about four miles, especially so during the rainy season when the roads were extremely muddy.

The accompanying cut shows the method employed in hauling the I. B. Davis Berry-

man heater, weighing five tons. In this case forty animals (horses, mules and don keys) and as many coolies were employed in getting the heater to the building from the railroad station. The heater was mounted on two two-wheel carts lashed together, and the animals and coolies were hitched to the forward cart by ropes and chains.

When a mud road is encountered the Chinese would employ a make-shift windlass, by digging a hole about 12 in. in diameter in the ground some distance ahead of the load, placing in this hole a post guide at the top with a trunnion head. By twisting the post around, the hauling rope was wound up on it, advancing the load by very low stages; all the time with great shouting, arguments of all kinds, and a huge audience of native rag-a-muffins looking on.

FIG. 3.—SINKING ARTESIAN WELL TUBES THROUGH MUD, QUICKSAND AND GRAVEL.

SINKING WELL TUBES.

Four artesian wells had been driven 5 in. in diameter, 300 ft. deep. Over each was to be dipped a suction tube of ⅜-in. boiler steel 3 ft. in diameter and 35 ft. long, with a bumped head at end, and a cast-iron flange of special construction for slipping over the well pipe.

There was a great deal of soft mud, quicksand, below which was a thick bed of coarse gravel. The surface water at this point stood within 12 in. of the surface of the ground under normal conditions. This meant that excavating for these suction tubes, which were on 11-ft. centres, was quite impossible owing to the diameter of the excavation and the caving in of the soil and the rising of the quicksand. A triplex pump was rigged up, electrically driven, taking suction from the water around the pipes strapped to the sides of the suction wells and pumping it through four 1-in. tube and terminating near the bottom in the form of a nozzle.

The discharge of the pump was connected through a series of pipes and heaters to the pipes attached to the suction tubes, by means of 2½-in. fire hose. Then an air tank was so arranged that the air and water were mixed together. By pumping this mixture through the pipes on the suction tubes as it left the nozzles, the water and

the expansion of air blew out the dirt and sand around the tubes. The tubes were suspended until the hole was blown out to a depth of about 5 ft., and then the tubes lowered down to this depth. It required about 2½ hours to blow out of these tubes 30 ft. The ground around the tubes was filled in to a depth of about 5 ft., where the pump house was erected.

The electricity for driving the pump motor was generated by a Diesel oil engine,, directly connected to a 15 k.w. generator.

ERECTING ENGINES AND DYNAMOS.

Fig. 4 shows the method employed in erecting two 225 Corliss Harrisburg engines, each directly connected to a 150-

FIG. 4.—METHOD OF ERECTING TWO CORLISS HARRISBURG ENGINES, WITH DIRECT-CONNECTED GENERATORS.

K.W. Westinghouse direct-current generator, by the use of improvised horses and the employment of large chain blocks. The Chinese mechanics, Mr. Hopkins states, are usually quite careful in the handling of machinery of this sort. They seem to appreciate the fact that an engine must be properly lined to get desired results.

He had no special difficulty in getting these engines and generators in complete working order in remarkably short time.

Nelson N. Thompson's "Mechanical Equipment of Federal Buildings" is now ready for delivery.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

New York Chapter Given Data on Operating Costs.

First-hand data on operating costs, compiled by George W. Martin, of the New York Service Co., which operates numerous power and heating plants in New York City, were presented by Mr. Martin at the November meeting of the New York Chapter. The meeting was held at the Engineering Societies Building.

The speaker had prepared several charts and tables which were explained at length. The first chart showed a curve of operating expense for office buildings of various sizes, the remarkable feature being that the curve was almost a straight line. All of the figures were for the operating cost per 1,000 cu. ft., based on the entire cubical contents of the building. The costs ran as follows:

Contents of building, cubic feet.	Cost per 1,000 cubic feet.
6,500,000	$1.04
4,500,000	1.32
2,097,800	1.42
2,032,000	1.74
1,600,000	1.75

These figures, the speaker stated, were fairly comparable, because they included practically the entire cost of operation, including coal, electric current, cost of ash removal, wages, etc. An instance of the general lack of knowledge of such costs was shown by the statement that in a building containing 5,000,000 cu. ft., the actual cost of operation averaged $9,000 per year, whereas the architect's preliminary estimate was no less than $20,000. The fact that the plotting of these costs produced so nearly a straight line would indicate, said the speaker, that such a unit may be used to establish operating costs in other buildings of the same type. In this connection he stated that the coal used in the buildings listed was No. 3 Buckwheat, costing $2.50 per ton, burned under forced draft.

Mr. Martin stated that the cost of labor per ton of coal is another phase of the problem upon which he is securing data.

The second chart shown was a coal consumption curve in an office building for two successive seasons, one season without a steam meter and the other with a steam meter installed. An average outside temperature curve was also included in the

chart. The coal consumption, without the meter, ran from 600 tons in January, to 300 tons in May and back to 550 tons in December. After the meter was installed the saving in fuel was very noticeable, the coal used in October, for instance, running 100 tons less than for the same month the previous year. The results with steam meters, he said, had made him a firm believer in the use of these devices to effect coal economies.

The next table presented by Mr. Martin was one showing the cost per 1,000 lbs. of steam produced of the different types of coal in common use. This table was as follows:

Grade of coal.	Market price, net, per ton	Cost per 1,000 lbs. of steam. Test 1.	Test 2.
No. 3, Buckwheat..	$2.50	12.61	12.26
Soft and No. 3.....	3.15	15.6	16.4
No. 2 Buckwheat..	3.15	19	19.6
No. 1 Buckwheat..	3.65	19.86	18.25
Pea	$4.25-4.50	21.7	20

These figures, he explained, showed the relatively high cost of pea coal, although it has the advantage of not needing such frequent attention to the fire, and this fact should be taken into consideration in figuring the cost, as its use would show a saving in the firing cost. The foregoing figures are based on a forced draft in the ashpit of about ½-in., the firemen being instructed to keep the draft so that a handkerchief held near the draft door would be gently drawn in. The tests were conducted for a period of 24 hrs. in each case.

The last chart shown by Mr. Martin gave the cost of generating industrial steam over a period of 11 months. The building was 4,500,000 cu. ft. in volume and it was agreed that anything in excess of 24,500 lbs. of steam per day used exclusively for industrial purposes, was to be paid for on the basis of the cost plus 5%. The table explained how a fair basis was arrived at to determine the relative cost of generating steam for heating and for industrial uses.

President Driscoll, of the New York Chapter, announced that the entertainment committee for the society's annual meeting, of which J. I. Lyle is chairman, had been made up by the appointment of Messrs. F. L. Pryor, N. L. Schloss, H. G. Issertell, Douglas Sprague, G. G. Schmidt and B. K. Strader.

Mr. Chew reported for the committee on amendments to the society's constitution, saying that the final report was not yet completed, but that it would include a proposition to change the date of the society's annual meeting to May. One of the committee had also suggested that the names of candidates for membership in the society be published in the society's Journal. This is a part of the plan to reduce the cost of electing members to the society.

It was announced that the December meeting would be held on December 13, instead of on the third Monday of December, and that the subject of the meeting would be "Vapor-Vacuum Steam Heating Systems." Manufacturers and others interested were invited to attend.

There will be no January meeting on account of the annual meeting of the society. The February meeting will be addressed by M. W. Franklin on a topic to be announced later.

Illinois Chapter Discusses Power Plant Development.

Power plant development, with particular reference to the operating department of the Commonwealth Edison Company of Chicago, was the subject for discussion at the November meeting of the Illinois Chapter, which met in Chicago November 8. The principal speaker was W. L. Abbott, chief operating engineer for the Commonwealth company. An idea of the capacity of the Commonwealth plant was gained by his statement that 5,000 tons of coal were burned a day in the manufacture of electricity. With this consumption the local plants of the Commonwealth Edison Company will deliver 400,000 H.P. during the coming winter on the peak loads. The maximum thermal efficiency, he said, is 16½% of the energy of the coal. The plants generate a kilowatt hour with 11 lbs. of steam. Mr. Abbott told of the arrangements that made it possible for the coal to be burned without smoke in the larger plants, one of the principal items being a high temperature in the combustion chamber. The smaller plants, he added, are still paying their quota to the maintenance of the city smoke department.

The speaker gave some striking figures regarding the action of steam in passing through the company's large turbines. In these units, he said, the steam velocity is no less than 2,000 ft. per second and during the time it passes through the turbine, which is about one-hundredth part of a second, it must expand some 700 volumes. From the time the steam leaves the boiler until it is condensed in the condenser the period is about three seconds.

The heavy duty imposed on the modern steam turbine makes the matter of amortization an important factor. For instance, the turbines installed in the Harrison

Street power plant in 1894 had practically served their usefulness by 1903. A similar experience was had with those installed at a later period. This indicated that the period of usefulness of a large steam turbine was about ten years, as after that it would have to give way to more efficient apparatus.

Other matters taken up by the speaker were the methods used in welding joints in steam mains and the possibilities of the use of electricity for heating purposes.

Massachusetts Chapter Hears Talk on Vacuum Heating.

William G. Snow was the principal speaker at the November meeting of the Massachusetts Chapter, his subject being "Vacuum Heating." The members met November 9 at the Revere House, where a chapter dinner preceded the meeting. There were 45 members and guests present. Mr. Snow's remarks were illustrated by lantern slides. Among the guests, some of whom took part in the discussion, were Edward C. Baldwin, of the State Board of Education; John H. Plunkett, of the State Building Department; Richard A. Lynch, superintendent of building in Boston; Thomas H. Wilson, plumbing inspector for the city building department, and Thomas J. Donellon, of the City of Boston Health Department.

New chapter officers were elected as follows: President, Eugene R. Stone; vice-president, Fred S. Bolz; secretary, Charles Morrison; treasurer, William T. Smallman. Board of Governers: William G. Snow, Frank Irving Cooper and J. W. H. Myrick.

Institution (British) of Heating and Ventilating Engineers.

Following are the new officers of the Institution of Heating and Ventilating Engineers, elected at the autumn meeting of the institution in London, October 12:

President, S. Naylor; vice-president, W. W. Nobbs. As announced last month, papers were read by Walter Jones on "Heat Transmission and Heat Emission" (published in abstract on another page), and by S. Naylor on "A Comparison of Forced Firing and Slow Combustion."

The institution has undertaken some ambitious work in attempting to formulate a set of standard coefficients for heat losses, many of which are to be determined through original investigations and tests under the direction of A. H. Barker at the University College in London.

Another question being taken up is the determination of the heat emission from radiators and pipes "under all conditions." Other suggestions include the preparation of formulae dealing with the flow of water in pipes, and the carrying out of original tests to determine the calorific value of well-known fuels, especially for the use of heating engineers.

Information Wanted on Instantaneous Water Heaters.

Editor HEATING AND VENTILATING MAGAZINE:

Is there on the market any instantaneous or automatic water heater operated with gasoline as fuel, or any except those using gas?

WALTER EHA.

Boulder, Colo.

Amount of Humidity Obtained with Air Moistener.

The recent discussion as to whether any of the warm air furnaces now on the market are equipped with air moistening devices that will fulfill the requirements of maintaining 40% to 50% at 70° F. indoors when the entering air is at 32° F. and 25% saturated, has brought out some interesting facts regarding the Filtros air moistener, made by the General Filtration Company, Inc., of Rochester, N. Y. This moistener, although applicable to furnace heating systems, is adaptable to any type of system.

The relative humidity that is obtained with the Filtros air moistener, it is stated, depends entirely upon the number of separate moistener units that are installed. In this respect the system is similar to that of the Air Moistener Co., of Chicago (Steamo air moistener), and of the Savo Mfg. Co., Chicago (Savo air moistener). If a sufficient number of units are placed in the heating apparatus, a relative humidity of from 40% to 50% at 70° F. can be maintained under all outside weather conditions down to a minimum outside temperature of from 5° to 10°.

The General Filtration Company calls attention to the fact that the relative humidity of the outside air is not so important a factor as might at first be supposed, because with all temperatures ranging from 32° down to zero and below zero, the total moisture capacity of the air is so limited. as compared with temperatures ranging from 60° up, that the humidity at the lower temperatures is more or less negligible.

An interesting statement made by this company is that in direct and indirect steam and hot water heating, approximately one-third greater area of the filtrous air mostener is required to maintain a given humidity than in warm air furnace heating, the

reason for this, as given, being that in the latter type of heating much more heat is encountered and consequently a more rapid evaporation.

An Electric Heating Experiment in Spokane.

Much interest is being taken in the experiment in electric heating being carried on under the direction of the Washington Water Power Company in Spokane. A large residence has been fitted out by the company with an electric water heating system. Among the problems that it is proposed to solve is the regulation of the current so that the consumption can be brought down to a competitive basis with fuel. It is admitted that electric current will cost probably twice as much as any other heating medium. As proposed, the electric heating system will run itself, turning on more heat as the temperature drops and shutting off the heat when the opposite limit is reached.

It is recognized that the heaviest heating load will come at the time of the heaviest electric light load and one of the problems to be worked out is the storing of enough reserve heat so that the heating current may be shut off from each house from 5 to 9 p. m. daily. The following description is given of the equipment proposed:

The system is being installed in a 10-room residence in Spokane, a frame building in an exposed location. Being an experiment, it consists of an auxiliary plant directly attached to the present hot water heating system.

The system consists of a 40-kilowatt transformer, installed in a fireproof vault in the basement of the house. This transformer reduces the line voltage, which is 2,300 volts, brought in from the power lines to a low voltage which is then taken to the necessary switches, heaters and controlling apparatus.

The hot water heaters have a capacity of 32 kilowatts and are divided into units of one kilowatt each. The control is automatic by means of thermostatic regulation, which consists of two distinct regulating systems. One thermostat is placed in a central point on the main floor, which controls the water supply to the radiators, and the other thermostat is attached to the boiler and controls the temperature of the water in the boiler, in order to store heat when the full heat is not required in the radiators.

Attached to this system, or rather connected to it, is also a clock mechanism, which cuts the electric heaters off the system at the time of station peak load, and also works in conjunction with the thermostat to regulate the temperature within very close limits.

This is probably the most complete electrical installation which has been thus far installed in any private residence. The object of this installation is to ascertain the practicability of heating residences in Spokane at a reasonable cost, as compared to the present coal and wood methods.

Advantages claimed for the new system are automatic operation, no handling of ashes or fuel, uniform heat, no dust or smoke, always ready for use, no labor required for operation, full heat instantly available without waiting for fire to build up, and practically 100 per cent. efficiency at all times.

The Heat Balance of the Human Body.

The question of temperature is perhaps one of the most important of any in connection with the question of ventilation. Human beings differ in their likes and dislikes, but in one thing they seem to be fairly constant and that is in the amount of heat they require. As between the Esquimo and the African negro, there does not exist a great difference in the amount of heat radiated in 24 hours. Human beings lose heat by convection and combustion in exactly the same way, so that the amount of heat required depends on the difference of temperature and the temperature of the surrounding air. These differences are taken care of by means of clothing. When a man wears clothing, he is surrounded by a volume of air that does not diffuse so that the factor of convection and diffusion become less.

Now, the correct temperature at any place is a variable. It is a function of the natural temperature of the body and of the amount of clothing and condition of clothing at the time. When a man puts on clothing, he is modifying the law to the extent that he is modifying the amount of heat lost by convection and diffusion and increasing the amount of radiation, so that the total amount remains the same. There is one correct temperature and only one, but that is a constant which varies. It depends entirely on the clothing.

If, in the north, where people wear fur and cover large portions of their body, the outside temperature can be one thing, and in the south, where they cover less of their bodies, the temperature can be higher and

the total amount of radiation from the bodies in each case will remain the same.

In order to maintain a fixed temperature in a room, the correct temperature having been decided as a result of taking into consideration the function of the clothing, there is one amount of air for a given temperature of entering air which will maintain a room at this fixed temperature. If the entering air is cold, a very small quantity is needed, because the amount of heat given off by the people is a constant. If, on the other hand, the temperature of the incoming air is high, a very large quantity will have to be brought in.

Throughout all this, there comes the question of humidity. Assuming that each human being gives off a certain definite quantity of heat in 24 hours and a certain definite quantity of moisture which does not vary, we can write an equation for the incoming air if we know the humidity, or if we know the temperature, for the humidity, so that those problems can be solved.

As I use the term, the problem of heating means simply this, that a human being gives off a certain amount of heat in 24 hours and a certain amount of moisture which is evaporated at a certain degree of latent heat of evaporization. Then you determine by the intermediary of clothing and, if necessary, artificial heat, what you require.—M. W. FRANKLIN, *before the Heating Engineers' Society.*

The Importance of Publicity for the Engineeer.

Why should we engineers be interested in publicity? Is there good reasons for departing from the time-honored precept that our achievements are sufficient witnesses to their creator's ability?

The country is burdened with wastefulness where engineering skill might save vast sums. For instance, it is planned to spend a hundred million dollars on highways in New York state without adequate provision for maintenance. It is hardly possible that such a proposition would have been seriously entertained if the public had waited for the opinion of the engineering profession before making a decision. Again: Recently a proposition to spend fifty million dollars on good roads in Ohio was voted upon without any preliminary studies or surveys as to how the money was to be spent. Had the proposition been approved, the money would have been largely wasted under the direction of jockeying politicians.

There is a vast national field for furnishing engineering information to the public, which can be taken care of only by a permanent national information bureau conducted by engineers.

We have technical and research societies without number—so many that the public can hardly be blamed for believing that we are interested in material things only. Perhaps we need a national bureau to conduct and cultivate business relations with the public, including inter-society relations, publicity, employment, and legislation.

All over the country there is a growing protest against the direction of municipal affairs by the lawyer and the politician. The administration of municipal business is largely a function of engineering. Why not enable the public to see this situation in its true light and thereby perform a public benefaction, as well as advance our own interests? Positions for engineers would increase in number, and compensation likewise.—C. E. DRAYER, *before the Engineering Section of the Chicago Association of Commerce.*

Comparison of Various Heat Insulating Materials.

The following tabulation, compiled by the United States Bureau of Standards and published as Circular No. 55 of the bureau, gives the thermal conductivities of a number of common materials, also the number of B. T. U. of heat which would pass in one hour through a sheet of the material 1 ft. square and 1 in. thick, if the difference in temperature between the two faces were 1° F.:

Material.	Thermal conductivity, metric units.*	Transmission in B. T. U. per hr., per sq. ft., per in., thickness for each degree F difference in temperature.
1. Silver	1.	2900.0
2. Copper	.9	2600.0
3. Aluminum	.5	1450.0
4. Iron	.14	400.0
5. Rock	.0025 to .009	0.7 to 26.0
6. Porcelain	.0025	7.2
7. Brick	.002 to 005	6.0 to 15.0
8. Glass (ordinary)	.0016	4.6
9. Water	.0014	4.0
10. Plaster (ord'n'y)	.001 to 0015	2.9 to 4.3
11. Wood (hard)...	.0006	1.7
12. Asbestos paper.	.00045	1.3
13. Asbestos felt...	.00025	.7
14. Sawdust	.00018	.52
15. Wood (v'y soft)	.00015	.43
16. Paper	.00013	.38
17. Cork board.....	.00012	.34
18. Wool	.00010	.29
19. Hair felt.....	.00010	.29

20. Cotton wool....	.00009	.26
21. Feathers	.000057	.16

*Thermal conductivity in metric units is the amount of heat in calories which will pass in one second through each square centimeter of a plate 1 centimeter thick, if the difference in temperature between the surfaces is 1° C.

Heating Values of Various Fuels.

The following tabulation gives the approximate amount of heat produced by burning several different kinds of fuel, also the number of gallons of water which could be heated from 32° to 212° F. for 1 ct. if no heat were lost. The figures apply to cost of heat actually supplied to water; true cost depends also on proportion of heat utilized, and this again depends on nature of fuel. Thus gas costing six times as much as hard coal for each heat unit may still be cheaper when heat is needed for only a short time.

Material.	Heating-value.		Price.	Gallons of water which could be heated from 32° to 212° F. for 1 cent.
Softwood	Btu per lb.	8,000	$4 per cord (2 tons)	53.0
Hardwood	Btu per lb.	8,000	$4 per cord (3 tons)	80.0
Soft coal	Btu per lb.	13,000	$4 per ton	43.0
Hard coal	Btu per lb.	13,000	$7 per ton	25.0
Coke	Btu per lb.	12,000	$5 per ton	32.0
Charcoal	Btu per lb.	16,000	$25 per ton	8.5
Fuel oil	Btu per lb.	18,000	$1.25 per barrel (50 gals.)	36.0
Kerosene	Btu per lb.	18,000	$0.10 per gallon	8.3
Alcohol	Btu per lb.	12,000	$0.50 per gallon	1.0
Gasoline	Btu per lb.	19,000	$0.20 per 1,000 gallons	3.5
Natural gas	Btu per cu. ft.	1,000	$0.40 per 1,000 cubic feet.	17.0
Manufactured gas	Btu per cu. ft.	600	$1.00 per 1,000 cubic feet.	4.2
Electricity	Btu per kw hr.	3,400	$0.10 per killawatt hour..	0.23
Ice (to absorb heat)	Btu per lb.	160	$0.35 per hundredweight.	*0.32

*Water from 212° F. to 32° F., gallons for 1 cent.

(From Circular No. 55, U. S. Bureau of Standards arranged by Data, Chicago.)

The Rolling Ball Steam Trap.

One of the latest steam traps to be placed on the market is that known as the J-M steam trap, manufactured and sold by the H. W. Johns-Manville Company, of New York. The unusual construction of this trap lends special interest to the story of its design and development which was told by Prof. C. S. Brown, of Vanderbilt University, Nashville, Tenn., at a recent meeting of the Ohio Society of Mechanical, Electrical and Steam Engineers. Prof. Brown, it will be recalled, was the designer of the D. G. C. valve, which was entirely independent of floats or of thermostatic elements such as had been previously used in devices of this character. This device depended for its action on the vacuum produced between two co-operating surfaces, that of a valve and valve-seat, by a jet of steam.

Since the disposal of his rights in the D. G. C. valve, Prof. Brown, appreciating that ultimate results in the way of simplicity and effectiveness had not been reached in this line, turned his thoughts to new methods of accomplishing the same purposes and very soon conceived of the rolling float device. He had doubts, however, as to its effectiveness in the discharge of air.

EXPERIMENTAL DEVICE MADE OF GLASS.

The first device produced consisted of a float made from a small spherical incandescent lamp bulb, from which the socket connection and filament were removed; the glass bulb was weighted with mercury to give it approximately 50 per cent. submergence in water. This was enclosed in a glass case, from which suitable tubes were laid for inlet and discharge connections.

This apparatus was placed on a radiator operating under gravity conditions with a steam pressure approximately 1 lb., and the operation of the float on its valve seat was studied through the glass casing.

This first experimental device demonstrated the exceedingly satisfactory action of the apparatus, not only in freely discharging water, but in discharging air; not only was the air discharged freely when the water level was sufficiently high to cover or seal the orifice, but this action continued when the pressure was increased to such an extent as to raise the water level around the float so that it stood as much as ¾ in. above the top of the orifice.

Following these experiments other glass floats were made and a few spherical copper floats obtained. These were put into use as drain valves for radiators operating under varying conditions in the writer's laboratory. These radiators were kept in continual use for several months in order to determine the dependability of the device under conditions of normal service. The steam in these radiators was shut off and turned on frequently, so as to approximate normal conditions of operation as closely as possible, and the device was demonstrated to be quiet and dependable in all its functions.

It was early appreciated that the apparatus, while suitable for the drainage of vessels condensing only small quantities of steam, was also equally adaptable to apparatus in which the rate of condensation was very high, and very shortly after the completion of the preliminary experiments, a number of steam traps of considerable size operating on this principle were manufactured and put into immediate use.

PRACTICAL APPLICATION OF TRAP TO LARGE OIL SEPARATOR.

The first device of this character was built for use on a large oil separator on the exhaust line leading from the Vanderbilt University power plant and supplying steam to its vacuum heating system.

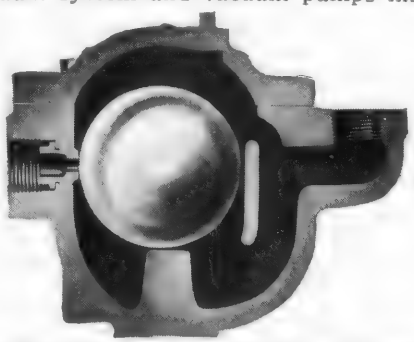
Several traps both of the float and the bucket type had been used on this apparatus and each one had failed to be effective, due to frequent stoppage by sediment and thickened oil from the separator.

The device constructed for this purpose consisted of a 5-in. copper float operating on a discharge nozzle, containing a ⅜-in. orifice. This was installed on the separator in October, 1908, and has now been in use seven years on continuous service, during which time it has never failed to operate successfully. This has been opened occasionally for examination and the float and orifice have been found in perfect condition, although the discharge nozzle is made of ordinary yellow brass. The float after its seven years of service is covered with a blue oxide and presents a beautiful polished surface.

INSTALLATION AT VANDERBILT UNIVERSITY.

Other traps of similar character were built at the same time and installed on both high and low-pressure lines and on vacuum lines. These traps are all still in use, some of them having never been opened since their original installation. Quite a number of radiators at various points in the University installation were also equipped with small traps of this character, most of them consisting of spherical floats of copper 1½ in. diameter, which were inserted directly in the radiator, operating on a brass nozzle, fitted with an orifice of suitable size and discharging into the vacuum lines. All of these have operated satisfactorily since their installation and have required so little attention that the exact locations of some of them have been forgotten.

This device having proven so satisfactory for work of this character, it was used throughout a new system covering about ten acres of ground when the new Medical Department of the University was established; approximately four hundred of these devices both as radiator drain valves and as traps on high pressure and low pressure mains were installed in the various buildings of the Medical College and have been operating since 1910 with results which have been satisfactory in every particular. While this system was designed as a vacuum system and vacuum pumps installed, it was never operated as such, it having been found that perfect circulation could be maintained and the water returned to the power plant without the use of vacuum pumps and with a steam pressure on the heating mains of not over 1 lb. This having been found to be the case, the return lines were vented at the various buildings, permitting the discharge of air at various points, while the water of condensation returned by gravity to the power plant. These vent pipes have always been free from vapor, demonstrating conclusively that the traps leak no steam and that any vapor formed by re-evaporation was condensed in the return lines within the buildings, nothing but water returning in the underground lines from the buildings to the power house.



CONSTRUCTION OF ROLLING BALL STEAM TRAP.

The devices have, therefore, demonstrated their dependability and value by long service, both on vacuum and gravity work, and the writer is not aware that any re-

pairs, either to floats or discharge nozzles have been required during this period.

REQUIREMENTS OF ROLLING FLOAT TRAPS.

Mechanically the device is the equivalent of the ordinary float trap, with its lever, fulcrum and valve. The float itself is the valve, while its radius is the lever at the end of which the force produced by the buoyancy of the float may be considered as concentrated. The fulcrum is at the upper edge of the orifice, about which the float rolls. The valve proper is that portion of the float covering the orifice and its lever arm is the orifice radius.

EXAMPLE SHOWING POWER OF TRAP.

A numerical example may illustrate the power of a device of this sort in operation under steam pressure.

For instance, a float 4 in. diameter, constructed of such thickness of metal as to float one-half submerged, when free would weigh about one-half pound, and would have to be loaded by ½ lb. in order to completely submerge it. This ½ lb. is, therefore, the buoyancy of the float. This acts as if concentrated at its center of gravity, the center of the float, and through a lever arm with respect to the top edge of the orifice equal to the radius of the float, or 2 in. The moment of this buoyancy with respect to this point is, therefore, ½ lb. × 2 in = 1 in. lb.

If it is assumed that the diameter of the orifice is ¼ in., the area of such an orifice is about one-twentieth of a square inch; a pressure of 160 lbs. per sq. in. in the trap would produce a pressure of 1/20 × 160 lbs. or 8 lbs. of the area of the orifice. This pressure of 8 lbs. on the orifice acts as if concentrated at its center of gravity, that is, its center, which is ⅛ in. from the edge of the orifice. The moment of the orifice pressure is 8 lbs. × 1 in. lb. This is exactly equal to the moment of the float with respect to its fulcrum. In other words, the maximum capacity of a 4-in. float to operate on an orifice ¼ in. diameter would be reached when the pressure within the trap was 160 lbs.

CAPACITY OF ROLLING FLOAT TRAP TO DISCHARGE AIR.

One of the most important characteristics of the rolling float trap is its capacity to discharge air. This feature is of primary importance for drainage of radiators, heating coils, steam mains, cooking utensils, laundry machines, glass coils and other units, which otherwise would become air bound and have their effective operation thereby prevented. Air binding also interferes with the operation of a trap itself by preventing the free inflow of water. Unless provisions are made in steam traps for the elimination of air, serious accidents to steam-operated apparatus are likely to occur, due to the failure to discharge the water of condensation and the consequent filling of the system with water. The rolling float trap has a lateral discharge orifice which is relatively close to the surface of the water when the trap is in operation. By properly proportioning the face of the nozzle containing the discharge orifice, the air can be made to pass out through the orifice even when the operating water level is considerably above the orifice.

With small traps for use on radiators, it has been found desirable to use a broad-faced orifice plug of such diameter that under ordinary operating conditions the water level would not submerge the plug, as, if this occurs, the space between the plug and float becomes sealed with water and the air discharge is not effective.

It has been found, however, with larger devices that there is an air discharged even when the orifice plug is deeply submerged. Under such conditions, particularly if the discharge is rapid, a pair of small vortices form, leading from the surface of the water to the orifice, thereby furnishing passageways for the outflow of air.

It might be inferred that after the discharge of such air as might have accumulated in a trap of this character thereafter steam would flow at a similar rate. However, experiment demonstrates that there is a materially different action when steam is present. In the first place the passageway for air at the orifice consists of two exceedingly thin openings, one on each side of the point of contact between the float and the orifice. While flowing air tends to keep these clear of moisture, steam tends to fill these openings with moisture, and therefore, is impeded in its flow to the orifice.

It is well known that very thin cracks or leaks in air pipes carrying air under pressure will leak very rapidly while the same openings carrying steam will not leak appreciably. In other words, compressed air piping must be constructed with much greater care than steam in order to eliminate leaks. It is possible that similar causes permit relatively rapid air discharge through the above described openings, while they do not permit the overflow of steam in appreciable quantities.

An important feature also is that the outlet orifice is not easily stopped up. In case particles of sediment are carried to it the oscillating action of the float tends to grind them up into smaller particles and

they are swept through the orifice and discharged.

In order that this action may be more certain the orifice is made very short, discharging into an opening of much larger area than itself, so there is little opportunity for it to become clogged with dirt.

In the smaller floats, the form of the float and its free action make it possible to utilize it as a check valve to prevent back flow. In case this is desirable an inlet nozzle with a suitable seat for the float to rest on makes this device operative as a check valve.

NEW DEVICES

New Types of the Steamo Air Moistener.

The rapid growth of humidification by the use of steam, and the increasing demand for the Steamo air moistener has made necessary the development of new types of this device, which are shown herewith. The principle underlying the operation is of interest and its explanation will assist in an understanding. The device consists briefly of a silencer through which steam flows and in which noise is eliminated. This silencer is surrounded by a steam jacket to prevent condensation. The flow of steam is controlled by a valve.

As shown by Fig. 1, the base is threaded on the inside for connecting to the top of a vertical pipe, through which steam enters and by which condensation returns. A passage in the lower part of the moistener leads to the control valve from which it extends to the silencer chamber. Steam entering by this passage expands in the chamber surrounding the silencer, through which it penetrates to a central passage and is designed to escape thence to the atmosphere as a noiseless, dry, soft vapor.

As shown, the steam passage, where it enters the silencer chamber, is extended to a point above the bottom, forming a separator or water catcher, intended to assist in the efficient working of the device.

It was found during the experimental period that in the case of residence work, for example, when steam came on in the morning, as it entered the cold moistener, condensation accumulated in the silencer. This resulted in a sputtering noise which continued until this water had evaporated. After that, the operation was noiseless. Although this noise continued for only a few minutes, it was objectionable, especially in the early morning. With the separator, however, condensation drops into it, remaining to be evaporated a little later, and this, it is stated, entirely eliminates the starting noise.

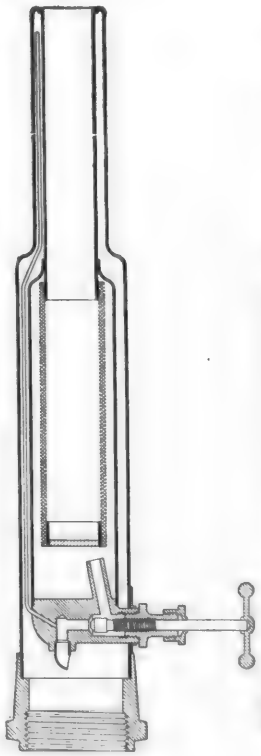


FIG. 1.—SECTIONAL VIEW OF SINGLE PIPE TYPE.

FIG. 2—SINGLE PIPE TYPE.

The successful operation of this device is based largely upon the work of the steam jacket, as unless the silencer is kept hot and dry, it will not only cause condensation and discharge of water, but produce noise as well. Therefore, as will be observed, the jacket is so constructed as not only to keep the silencer chamber hot, but also to heat its long outlet passage. In this way, the entire air moistener proper is protected from cooling influences, so that condensation occurs only in the jacket and drains back. Air binding of the jacket is prevented by a pipe which reaches from the top of the jacket to the valve chamber, insuring a constant flow of steam from the top of the jacket as well as from the lower part by way of the main inlet.

Fig. 2 is an exterior view of the single pipe type of which Fig. 1 is a section. It is made in three sizes: Nos. 3, 4 and 5 with ¾ in., 1 in. and 1¼ in. pipe threading.

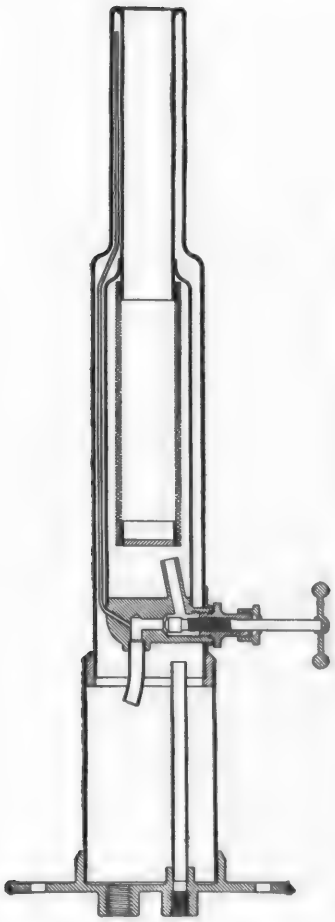


FIG. 3.—SECTIONAL VIEW OF TWO-TYPE.

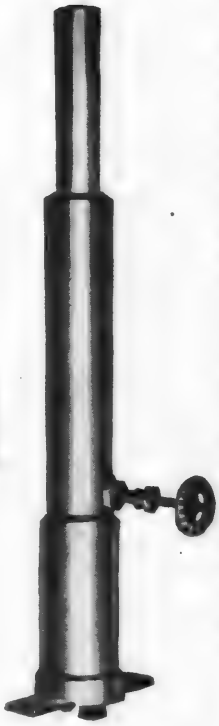


FIG. 4—TWO-PIPE TYPE.

Connections of such size are essential to insure a sufficiently low velocity in the flow of steam to allow the condensation to flow back against the current. While with the smaller and medium sizes, the one pipe type is economical to install, it becomes impractical in the larger ones on account of the size of the pipe that would be required. The larger sizes are, therefore, of a two-pipe design which allows of the use of quarter and three-eights inch piping.

As shown by Fig. 3, the base is provided with a large separating chamber near the top of which the entrance pipe terminates, the inlet to the controlling valve being so located that any water entering will not be drawn into the silencer chamber but will drop to the bottom of this separator to be carried out by the return pipe. The return water may be handled by connecting with a trap which discharges at a lower pressure than that of the supply, or if desirable to return the condensation into the same pressure as the supply, the return pipe may be so designed as to afford a sufficient water seal to prevent reverse flow in the return pipe. In the latter case, of course, the point of return must be lower than that of supply. Fig. 4 is an elevation of this type, which is used mostly for industrial purposes, large offices, etc.

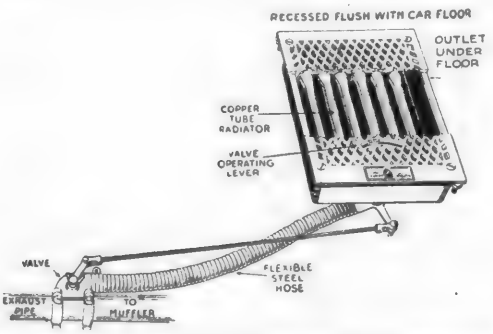
The No. 2 size has proven to be of about the capacity required to humidify the space which is heated by an average sized radiator. It is, however, designed for attachment to radiators. But as it is desirable to have the means of heating and humidifying separate, this combination is had in those cases where vertical steam risers are employed, by attachment of an equivalent size to the riser. For this purpose the No. 2 riser type, shown in Fig 5, has been devised. This has a long stem, carrying it a proper distance from the riser, into which it screws by a ⅜ in. pipe thread. The slope of the connection gives ample drainage from the jacket and the extension of the inlet pipe into the riser, insuring not only dry steam but preventing the velocity interfering with the drainage. This and types Nos. 1 and 2 embody the same interior features as shown in the sectional view, differing only in the way they take steam and discharge condensation, as they screw directly into the riser or radiator without the intervention of any piping.

FIG. 5.—RISER TYPE.

The Steamo air moistener is manufactured and sold by The Air Moistener Co., 28 North Market Street, Chicago.

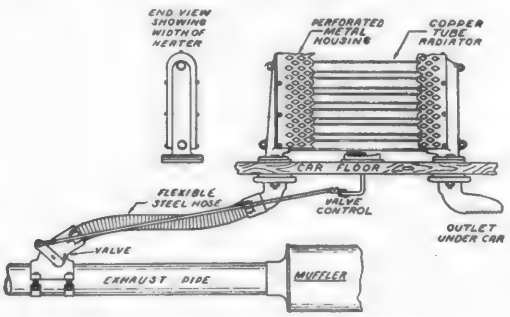
Heater for Automobiles.

A unique device for heating the interiors of automobiles by utilizing the waste heat from the engine has been placed on the market by the Perfection Spring-Service



FLOOR TYPE OF AUTOMOBILE HEATER.

Company, Cleveland, O. It is called the Perfection heater. As shown by the accompanying illustrations, the floor type consists of a series of seamless copper tubes assembled into a manifold at each end. These radiating parts are carried in a rust-proof under-casing. The top plate, mounted flush with the car floor, is buffed and polished. The floor space occupied by the



VERTICAL TYPE OF AUTOMOBILE HEATER.

heater is 9¼ in. wide by 13½ in. long, while the depth over all is 2½ in. In this space over 200 sq. in. of radiating space is provided.

The vertical type is similar to the floor type, except that the heat control lever is located as a separate unit wherever desired. For this type a floor space of 3¼ in. by 15⅞ in. is required.

A Unique Metal Diaphragm Valve.

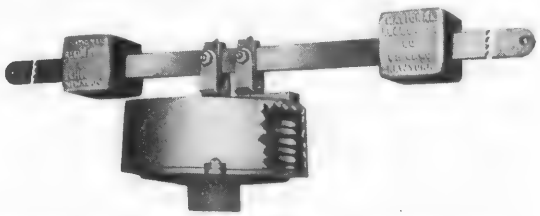
Something unique in the way of a metal diaphragm valve, applicable to any apparatus requiring a diaphragm, such as diaphragm valves for radiators, blast coils, hot water tanks, etc., is a product of the National Regulator Co., Chicago. It is called the "Metaphram." It comprises a number of separable, collapsible, corru-

THE DIAPHRAGMS OF THE METAPHRAM VALVE.

gated metal discs, connected by thread studs, making it possible to shorten or lengthen the diaphragm according to requirements. On the edge of each disc is a series of projections to enable the dia-

CONSTRUCTION DETAIL OF THE METAPHRAM.

phragm to be assembled or taken apart with the hands. There are but three parts to the valve—the spider, the car or top and the diaphragm. By removing the spider from the diaphragm the valve can be readily packed. Another advantage mentioned for this device is that if it should be necessary to remove a diaphragm it can be done by hand.



TYPE OF METAPHRAM FOR PRESSURE AND VAPOR HEATING.

The application of the "Metaphram" to boiler regulators is shown by the accompanying illustration. This device is un-

usual on account of its universal adjustment feature, permitting it to be adapted to either pressure or vapor and to any size or style of boiler.

An Adjustable Handle Angle Wrench.

An adjustable handle angle wrench, incorporating a number of unusual features, has recently been brought out by the Imperial Tool Company, Bloomington, Ill. The arrangement of the adjustable jaw

ADJUSTABLE HANDLE ANGLE WRENCH.

permits it to take any tap up to 1¼ in. at eight different angles, or the tap can be turned in close quarters by ratchetting the handle one or more notches at a time in either direction, by pressing the ratchet button. When the button is released, the handle is locked rigidly.

This wrench, it is stated, will take the place of many different sizes, styles and types of wrenches. It has been found to operate in positions and at angles where, it is stated, no other wrench can be used.

The manufacturers lay emphasis on the point that it is not a novelty wrench, but a practical tool, made of high grade material and capable of standing hard usage. It is made and guaranteed by the company, which manufactures various types of wrenches.

New Line of Turbine Vacuum and Air Line Pumps.

An interesting development in vacuum and air line pumps is announced by the Chicago Pump Company, Chicago, Ill., in the form of the Nash hydro-turbine vacuum and air line pumps which this company is now offering to the trade. The vacuum pump is designed for creating and maintaining a vacuum on a heating system and at the same time for returning the water of condensation directly to the boiler. The air line pump is for use in maintaining a vacuum on an air line vacuum heating system where only the air is exhausted from the system, the condensation water flowing back to the boiler by gravity.

The Nash hydro-turbine pumps, it is pointed out, have no wearing parts. The vacuum pump has but two bearings; these are on the outside of the pump and are grease lubricated. They have radial ball bearings and are found to require attention about once or twice a heating season. The vacuum is created and maintained by a hollow air impeller with projecting blades. This impeller revolves in an elliptical casing, partly filled with water. There are inlet and outlet ports at properly located points in the casing which draw the air into the casing when the water is at one

NASH HYDRO TURBINE AIR AND WATER PUMP FOR VACUUM HEATING SYSTEMS.

certain position, forcing the air out through the outlet ports by the water as it is forced to the narrowest point of the casing by the rotating impeller.

The pump and motor are mounted on an iron base and are direct-connected by a flexible coupling. In the pump casing there is a second impeller which handles the water only. This impeller pumps the water directly into the boiler.

An important feature noted in connection with this pump is that the air and water enter a receiver where the air and water are separated, the air impeller taking the air from the upper part of the receiver and discharging it into the atmosphere. The water impeller takes the water from the lower point of the receiver, discharging same directly into the boiler. As there is eight times more air than water returning from a heating system, only one-

eighth of the volume is pumped against the boiler pressure, the balance being discharged into the atmosphere. In this manner, it is stated, a saving is effected in comparison with the use of such pumps as are obliged to pump the entire quantity of air and water returning from the heating system against the maximum boiler pressure.

These pumps are described with further details in the company's Bulletin 31.

An Automatic Household Refrigerator.

An interesting type of small electric refrigerator, capable of providing the artificial chilling and ice necessary for table use by the average household, was shown at recent electrical expositions in New

WILLIAMS ELECTRIC REFRIGERATING AND ICE MAKING MACHINE INSTALLED IN STANDARD ICE BOX.

York and is illustrated herewith. It is known as the Williams electric refrigerating and ice-making machine and is made by the Electrical Refrigerating Co., Inc., Woolworth Building, New York. The illustration shows the machine mounted on a standard refrigerator. It is made in three sizes—¼ H.P., with a capacity of 150 lbs. of ice daily, price $300; ½ H.P., capacity 300 lbs., price $400; and 1 H.P., capacity 600 lbs., price $550.

The manufacturers state that these machines are not only regulated to maintain a constant temperature, stopping and starting automatically, but they are also constructed to run from one to three years without adjustment or renewal of chemicals. Ethyl-chloride is used as the cooling agent at a pressure of from 6 to 12 lbs. per square inch on the condensing side and at a vacuum of from 15 to 20 in. on the cooling side within the refrigerator.

The machine is driven by an electric motor and the cooling element occupies the space usually devoted to ice in an ordinary household refrigerator. The cooling coils are partly immersed in a brine tank containing receptacles in which small blocks of ice are formed. A temperature variation may be had in different parts of the refrigerator of from 24° F. to 46° F. at the same time. It is stated that the current required is about 2½ K.W.-hrs. for 100 lbs. of ice effect in the course of one day. At the present 8-cent maximum rate in New York City, this would make the cost of artificial cold 20 cents for the ice effect of 100 lbs.

Novel Test on a Molby Down Draft Boiler.

An impressive demonstration of the steaming qualities of the Molby down draft boiler, made by the Molby Boiler Co., 39 Cortlandt St., New York, was furnished in connection with a recent installation in a residence in Schenectady. A No. 477 Molby steam heater was connected to a vacuum heating system, with 2,200 sq. ft. of direct radiation. At the time of the test approximately 500 sq. ft. was connected. The smoke flue was 18 in. by 18 in. and 44 ft. high, the draft being reported as good.

On the day of this test there was a heavy rain all day, the temperature being practically stationary at 60° F. Fire was started at 8:30 A. M. At 9:05 A. M. a pressure of 3½ lbs. showed on the gauge. The pressure ran up so rapidly to 12 lbs., the safety valve blowing off, that a steam connection, 1¼ in. valved, running out of the third story window, was opened gradually to reduce the pressure. In order to keep the pressure down, however, it was necessary to keep the valve wide open. The safety valve on the boiler was blowing the greater portion of the day and it was necessary to open the flue doors occasionally to keep down the steam pressure. The pressure varied during the day from 5 to 12 lbs. To make up the steam losses the cold water supply valve to the boiler was left open during the test.

The boiler was fired with pea coal until the fire came to the top of the slots or gas ports, after which No. 1 buckwheat was put on, 100 lbs. at a time, half on each side

of the boiler. Then more coal was put on top of this. At 2 P. M. 450 lbs. of birdseye buckwheat coal was put on, equally distributed on the two sides, filling the boiler up into the magazines. At this time there was 5 lbs. of steam in the boiler. Within the next 30 minutes the pressure went up to 6½ lbs., where it remained until 5:30 P. M., the end of the test.

At 5:30 all the drafts were closed, also the damper in the smoke pipe, but the pressure did not go down. The front flue doors were then opened. This relieved the pressure, allowing the steam outlet on the third floor to be closed. Before leaving for the night, 450 lbs. more of birdseye coal was put on the fire, equally distributed on each side.

It was the intention to burn out all of this fuel to ascertain the condition of the ashes after the test, although the manufacturers do not recommend the use of such fine coal, as it is likely to sift through the grate. It was demonstrated that one-third No. 1 buckwheat coal can be used with pea coal in this type of heater without any disadvantage in securing thorough combustion.

New York Correspondence School of Heating and Ventilation.

A correspondence course in heating and ventilation has recently been inaugurated by James A. Donnelly, of New York. According to a circular accompanying the announcement, the course is intended especially for those who are not able to attend the various classes on this subject. It has been prepared for those who are already in the heating business or allied lines, but is limited to the design of direct heating systems and will be completed in ten lessons.

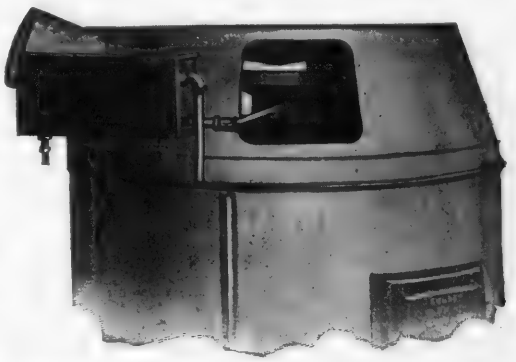
A number of problems illustrative of the work being covered will be submitted to the students, typical ones being solved in order to show the method followed. Those that are solved will be checked and returned, and any particular questions pertaining to the work in hand will be answered.

This procedure is similar to that of the New York School of Heating and Ventilation which was conducted a few years ago under the direction of James M. Harrison. In that case the lesson sheets were later bound under one cover and sold outright, the student then determining upon what subjects, if any, he desired instruction.

The fee for the new course compiled by Mr. Donnelly is $10.00. H. R. Innis, 132 Nassau Street, New York, is the secretary.

Trade Literature.

KELSEY AUTOMATIC HUMIDIFIER, for use with the Kelsey system of warm air heating, is called to the attention of the trade in a circular which illustrates and describes the device in detail. It is manufactured by the Kelsey Heating Co., Syracuse, N. Y. The



KELSEY HUMIDIFIER IN WARM AIR CHAMBER, SHOWING PIPE CONNECTION TO STORAGE TANK.

location of the humidifier in the warm air chamber of the furnace is in accord with the recommendations made by one of the speakers at the recent meeting of the Heating Engineers' Society. A small galvanized pipe runs from the humidifier through the casing at the top to a storage tank located near the furnace. A float located in the container makes the flow of water automatic. It is stated that with this apparatus the relative humidity is increased from 25% to 50%, depending upon the intensity of the fire. In a test made before the humidifier was placed on the market, it was found that a relative humidity of from 25% to 30% was obtained at 70° F. when the entering air was at 10° F.

GORTON SELF-FEEDING BOILERS are brought to the attention of the trade through the publication of a new catalogue covering this line, issued by Gorton & Lidgerwood Co., New York. A note on the title page states that "all boilers built to the A. S. M. E. standard." Broken views show the construction of these boilers in detail, including the wrought plate tubular boiler shell. An illustration is also included of the grate and fingered ring which is a feature of this line. This is so arranged that the base front can be unbolted and removed, and the entire grate or a single bar easily replaced. It is stated that the grate and fingered ring combined have 50% more air space than is usually found in grates of the same diameter. The Gorton soft coal steam boiler is also shown. The catalogue concludes with the company's well-known guarantee, which is flat, "providing the boiler is properly connected to a chimney flue hav-

ing a good and sufficient draft, and that all cellar piping is well covered and the boiler is run according to our printed directions." Size 4¼ x 7¼ in. Pp. 32.

ELECTRIC AIR HEATER AND BLOWER, designed to meet the demand for a small successful electric heater, has been placed on the market by the B. F. Sturtevant Co., Hyde Park, Mass., and is described in the company's Bulletin 219. The set consists of a motor-driven fan discharging air through heating coils placed in an aluminum casing. The apparatus is portable and can be used in the same way as electric cooking utensils in connection with any wiring system. It is useful for heating rooms quickly, especially in the fall or spring when the heating apparatus is not in operation. It may also be used for drying, for blowing the furnace, for ventilating purposes in the summer time and for various operations in industrial work. Its use in the garage has been found to be very effective. Size of bulletin 6½ in. x 9 in. Pp. 12.

STURTEVANT ELECTRIC AIR HEATER AND BLOWER.

(Fan outlet can be turned so as to discharge in any direction. Made in five different sizes. Air temperature is controlled by switch.)

IDEAL HEATING JOURNAL for November, 1915, the periodical of the American Radiator Co., Chicago, has an interesting article on the test of a sylphon regitherm on a central steam heating system in Indianapolis. Another article is entitled "Rules for Figuring Mechanical Ventilation in Theatres," with especial reference to the Chicago ventilation ordinance. The opening item tells of the use of wall radiators in tobacco barns for curing tobacco.

HONEYWELL TEMPERATURE REGULATORS, describing and illustrating the latest improved types manufactured by the Honeywell Heating Specialty Co., Wabash, Ind., are the subject of a new catalogue. The first place in the catalogue is given to the Honeywell Model 8 eight-day automatic thermostat. This device operates not only to raise the temperature in the morning but also to automatically lower it at night at any desired time and to any predetermined degree, with no attention except to wind the clock once a week. The construction of this instrument is made clear in the text. Other thermostats featured are the Model 6 one-day clock thermostat and the Model 4 plain pattern thermostat. All Honeywell thermostat models are made so that their respective parts are interchangeable. Attention is also called to the motors used with these instruments which operate on the regular A. C. house lighting circuit, reduced to 12 volts by a transformer built especially for this purpose. The company also furnishes a spring motor or a gravity motor where desired. The latter type is new. Illustrations are included showing how the regulators should be installed for different kinds of heating systems. Size 3½ x 6 in. (standard). Pp. 22.

ARC FIREPLACE DAMPERS, made by the Arc Fireplace Damper Co., Wilkes-Barre, Pa., are featured in circular matter showing the construction and operation of these unique dampers. The use of the arc principle of construction is explained on the ground that this form is necessary to properly deflect down drafts.

BI-MULTI FANS, made by the Bicalky Fan Co., Buffalo, N. Y., are the subject of circular matter in which it is stated that they are the strongest fans built. They are made to fit any requirement that fans may be used for. It is stated that their design and construction permit them to be operated at the highest pressures without racking and with the minimum horsepower.

FOXBORO RECORDING GAUGES FOR ALL PURPOSES are covered in an exhaustive and well-prepared bulletin (No. 98) issued by the Foxboro Co., Foxboro, Mass. Several new and important improvements are, for the first time, illustrated and described. For instance, the company has recently adopted the round form of case, which is consistent with the instrument design, especially when round charts are used. The company states that it has been able to adopt this type of case on account of the improved actuating movements. More complicated movements, it is explained, which take much more space, do not permit the round case feature. This construction has been found to appeal to engineers generally,

especially when the instruments are to be used on gauge boards, etc. A description is also given of the company's improved helical and diaphragm tube movements, together with other patented features of the Foxboro line. Size 8 x 10½ in. (standard). Pp. 40 (punched for binding).

BETTER BARNS is the title of a new circular sent out by the Globe Ventilator Co., Troy, N. Y., in which it is stated that exhaustive tests and thousands of experiments have shown that fresh air is the greatest of necessities for the preservation of the health of cattle. Globe ventilators are recommended for use on barns, stables, creameries, silos and farm buildings of every character. They are described as strongly constructed of heavy galvanized iron, and practically time-proof. Details are given of present installations of Globe ventilators on some of the largest stock farms in the country, the ventilators in many cases being shipped on repeat orders. The following table is given as an aid in estimating the ventilator size required:

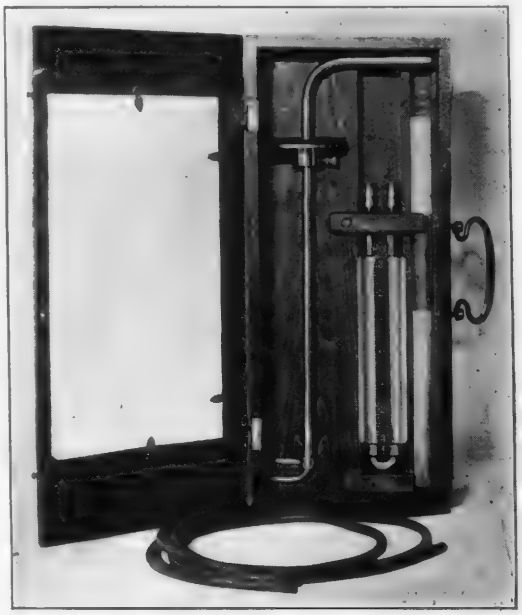
24 in.	10 horses	12 cows
30 in.	16 horses	20 cows
36 in.	22 horses	28 cows

BRISTOL COMPANY'S exhibit of recording instruments at the Panama-Pacific International Exposition is the subject of an article in the *Exhibitors' Weekly Bulletin* for September 25. 1915, published in San Francisco. The statement is made that the Bristol Company's exhibit was the most comprehensive of its kind ever made. The views show the booth from various angles, emphasizing its remarkable artistic appearance.

VALVE WORLD for November, 1915, the monthly periodical of Crane Co., Chicago, contains as one of its principal articles a discussion of "Motor-Operated Gate Valves," by J. E. Stark. The second of the non-technical chats on iron and steel and their application to modern industry is also published in this number, being entitled "The Raw Materials," by L. W. Spring.

OZONATORS FOR COLD STORAGE WAREHOUSES AND OZONATORS FOR STORES are treated in two recent bulletins from the Sprague Electric Works, New York. The machine used is the well-known type of ozonator which the company has had in successful use for several years, but its adaptation to cold storage warehouses for eliminating odors and preventing cross tainting is comparatively recent. The principal use of the machines is in the deodorization of storage rooms after they have been emptied of their contents in order to prepare them for the reception of other products. With these machines, it is stated, a thorough deodorization of a storage room may be accomplished in from two to three hours, in place of several days' airing and frequent whitewashing. The ozonators for use in stores are designed principally to eliminate those odors caused by the class of material carried, such as fish, vegetables, fruits, linoleum, rubber, etc. A typical installation is described, in the department store of Lit Bros., Philadelphia, where ozone is used as an adjunct to the ventilating system in the basement. Size of each bulletin 8 x 10½ in. (standard). Pp. 8 and 4, respectively (punched for binding).

GILBERT AIR MEASURING KIT, for measuring the velocity and volume of air and other gases in ducts, flues, etc., which, it was announced last month, is a new product of the Dwight Instrument Co., 6100 Greenwood Ave., Chicago, is shown in the

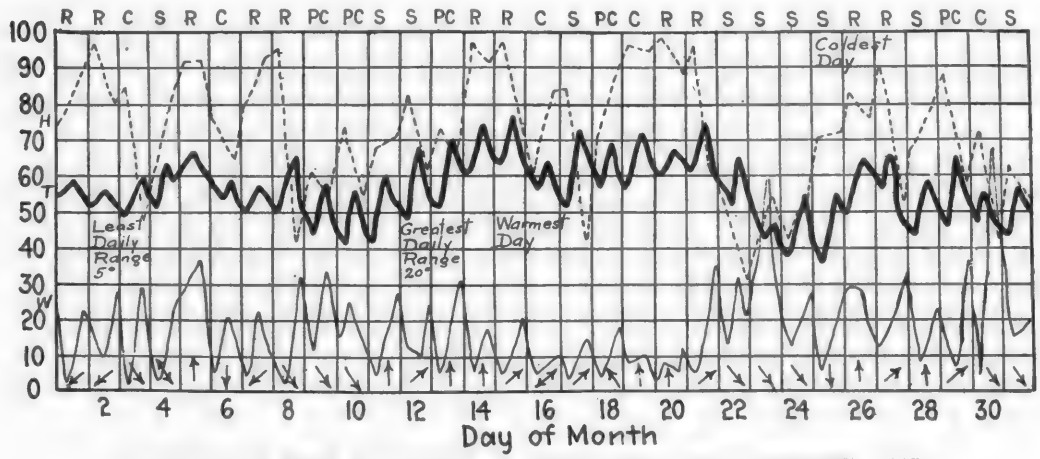


GILBERT AIR MEASURING KIT.

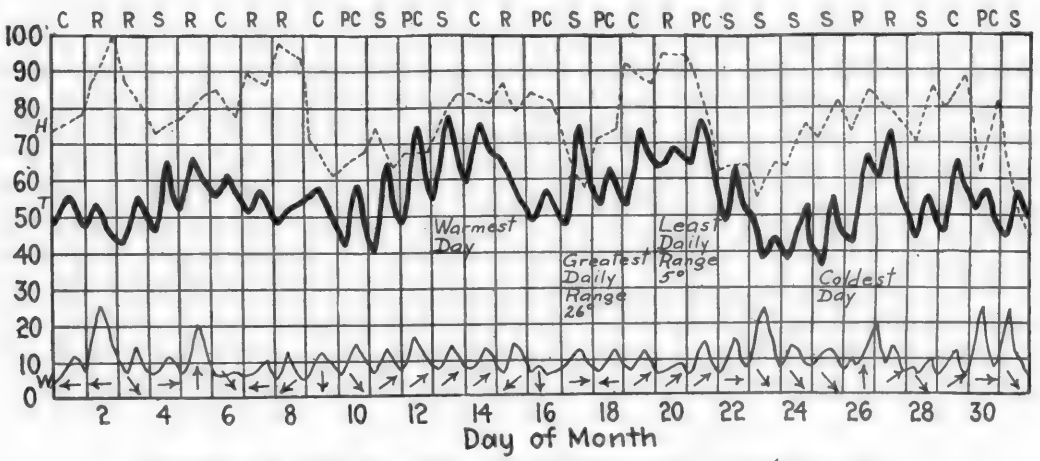
accompanying illustration. The manufacturers state that it can be used satisfactorily by the inexperienced and expert alike. Another point mentioned in its favor is that it eliminates much danger of error by eliminating all mathematics. The kit consists of a standard form of Pitot tube, draft gauge, thermometer, necessary rubber connections, charts for finding volume, velocity, horsepower, etc., without any preliminary calculations, and there is also a complete set of instructions. Charts are of the simple, straight-line type, further simplifying their use.

The Weather for October, 1915.

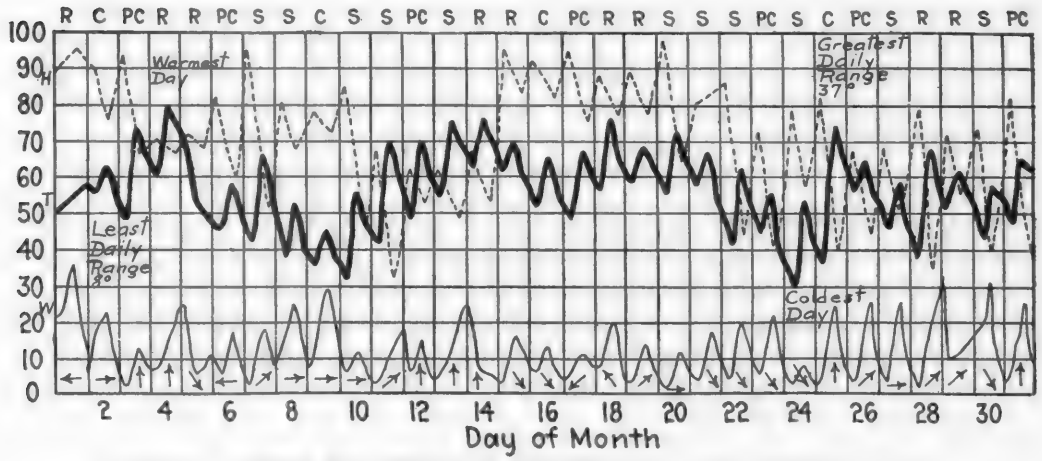
	New York	Boston	Pitts-burgh	Chicago	St. Louis
Highest temperature, degrees F.	77	78	80	79	82
Date of highest temperature	15	13	4	3	3
Lowest temperature, degrees F.	37	37	30	32	37
Date of lowest temperature	25	25	24	9	9
Greatest daily range, degrees F.	20	26	37	25	26
Date of greatest daily range	12	17	25	29	10
Least daily range, degrees F.	5	5	8	6	6
Date of least daily range	2	20	2	16	17
Mean Temp. for month, degrees F.	56.7	56	56	56.4	61.7
Normal mean temp. for month, deg. F.	55.6	52.3	54.9	53.2	58.4
Total rainfall, inches	2.25	2.82	2.84	0.4	0.9
Normal precipitation, this month in	3.71	3.86	2.36	2.55	2.41
Total wind movement, miles	11447	7276	7129	10139	9500
Average hourly wind velocity, miles	15.4	9.8	9.6	13.6	12.8
Prevailing direction of wind	N. W.	S. W.	N. W.	W.	S.
Number of clear days	12	12	14	13	22
Number of partly cloudy days	7	6	8	9	6
Number of cloudy days	12	13	9	9	3
Number of days on which rain fell	14	9	9	5	



RECORD OF THE WEATHER IN NEW YORK FOR OCTOBER, 1915.



RECORD OF THE WEATHER IN BOSTON FOR OCTOBER, 1915.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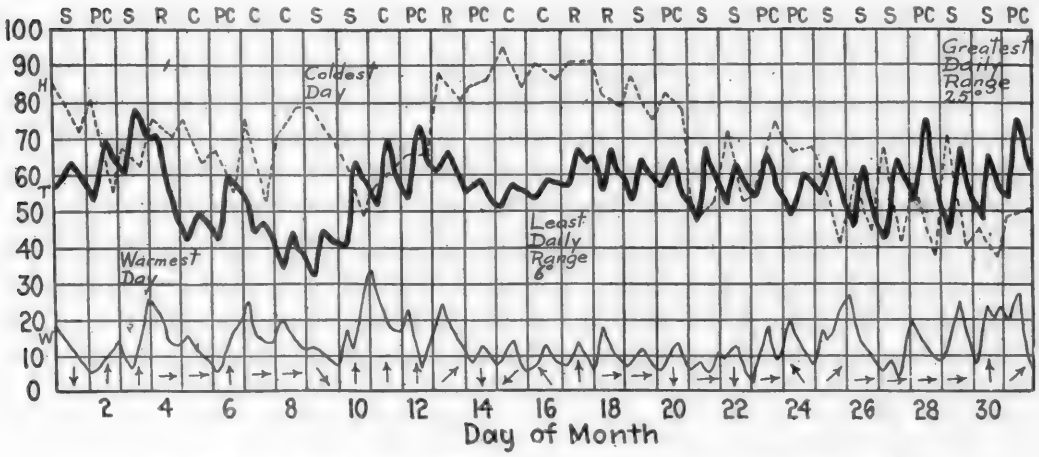
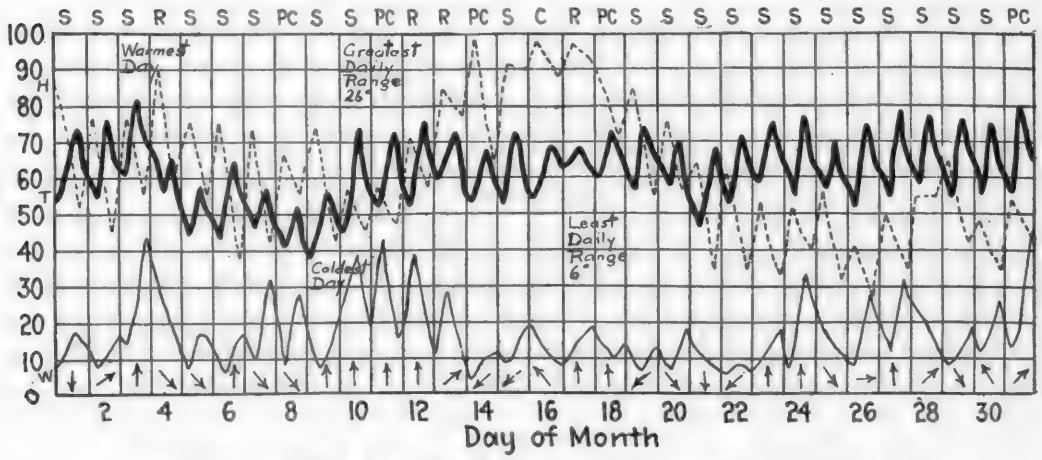
Warmest Day
Greatest Daily Range 37°
Least Daily Range 8°
Coldest Day
Day of Month

RECORD OF THE WEATHER IN PITTSBURGH FOR OCTOBER, 1915.


S PC S R C PC C C S S C PC R PC C C R R S PC S S PC PC S S S PC S S PC
Coldest Day
Greatest Daily Range 25°
Least Daily Range 8°
Warmest Day
Day of Month

RECORD OF THE WEATHER IN CHICAGO FOR OCTOBER, 1915


S S S R S S S PC S S PC R R PC S C R PC S S S S S S S S S S S PC
Warmest Day
Greatest Daily Range 26°
Least Daily Range 6°
Coldest Day
Day of Month

RECORD OF THE WEATHER IN ST. LOUIS FOR OCTOBER, 1915.

Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE, by the United States Weather Bureau.
Heavy lines indicate temperature in degrees F.
Light lines indicate wind in miles per hour.
Broken lines indicate relative humidity in percentage from readings taken at 8 A. M. and 8 P. M.
S—clear, P C—partly cloudy, C—cloudy, R—rain, Sn—snow.
Arrows fly with prevailing direction of wind.

Panama-Pacific Exposition Exhibits.

11—ARMSTRONG CORK COMPANY.

Cork in all stages, from the virgin state on the cork tree to the finished product, is included in the joint display of the Armstrong Cork Company and the Armstrong Cork & Insulation Company, allied corporations, at the Panama-Pacific International Exposition in San Francisco. Attractively arranged in 95 jars are shown as many varieties of cork. Another portion of the exhibit is devoted to heat insulating specialties, including Nonpareil high pressure coverings for steam lines and other heated surfaces, Nonpareil corkboard for insulating cold storage warehouses, etc., Nonpareil cork pipe covering for brine, ammonia and drinking water lines, and, finally, Nonpareil insulating brick.

Moving pictures and specimen bedrooms and living rooms are also features of the exhibit.

The company was awarded the Grand Prize for its display.

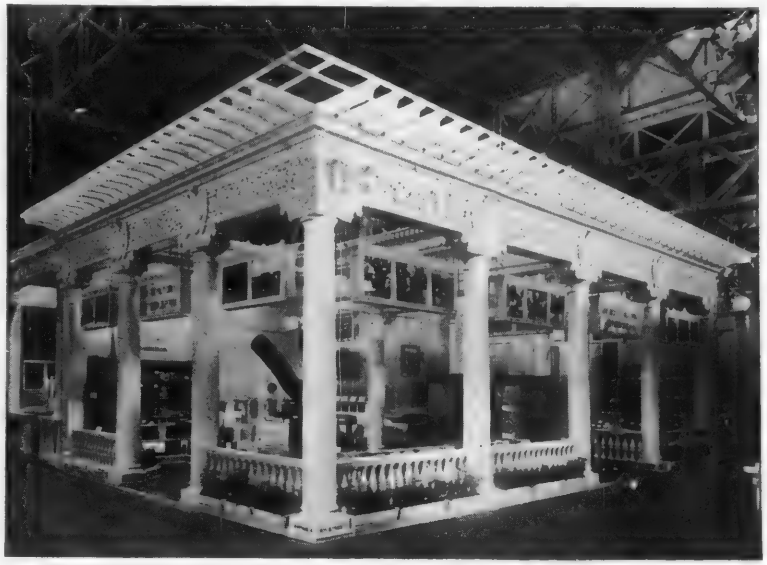


EXHIBIT OF THE ARMSTRONG CORK COMPANY.

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TRADE AND MISCELLANEOUS NOTES

Coming Events.

January 12-15, 1916—Winter meeting of the American Institute of Chemical Engineers, in Baltimore, Md.

January 18-20, 1916—Annual meeting of The American Society of Heating and Ventilating Engineers, at the Engineering Societies Building, 29 West 39th Street, New York. Secretary, J. J. Blackmore.

Miscellaneous Notes.

St. Paul, Minn.—The local Post Office Employees' Welfare Committee, an organization founded according to a plan suggested by Congressman Van Dyke for the improvement of the postal service and working conditions of the employees, has prepared a petition, requesting the improvement of the ventilating system at the St. Paul post office.

Edgemont, S. D.—The item published in the last issue referring to the system of heating buildings in that place by water supplied from the famous hot well spouter made it appear that the plant was located in California. It is in South Dakota and it is expected that the utilization of the hot water as it comes from the ground will make the business men independent of the usual types of heating systems.

Marshalltown, Ia.—Action that will probably mean the beginning of a complete remodeling of the ventilating systems of the old school buildings in Marshalltown has been taken by the school board in voting to install a modern heating and ventilating system in the Rogers School, the oldest in the city. The plans were drawn by F. D. B. Ingalls, engineer of the C. A. Dunham Co., of Marshalltown and include the use of fans, heating coils, air ducts and air washers. It is likely that the board will continue to improve the other old school buildings in the same manner.

Calumet, Mich.—In an address at the Teachers' Institute at Calumet recently on "Health," Governor Ferris took the ground that all windows in school rooms should be kept open, even in buildings equipped with ventilating systems. The Governor's remarks, it is reported, have created a considerable stir among the heating fraternity in Michigan.

Dawson, Y. T.—The large steam generating plant of the Canadian Klondike Mining Co., which was used for driving dredges and heating the company's shops, offices and general works, was destroyed by fire, October 29. A battery of three tubular boilers and a 400-K.W. turbine were ruined. This turbine was used to drive machinery at the St. Louis world's fair. The dredges will be operated for the time being by water power.

Aberdeen, S. D.—Of the $30,000 voted early in November for a new high school building in Clark, S. D., $5,000 will be used to install a central heating plant for both of the school buildings at that place.

Chicago, Ill.—As the result of a conference between Health Commissioner Robertson of Chicago and President Leonard Busby, of the Chicago surface car lines, the city prosecutor has been directed to withhold the filing of some forty suits against the

Genuine Armstrong Stocks and Dies

MALLEABLE HINGED PIPE VISES

PIPE CUTTERS

PIPE MACHINES, HAND OR POWER

The Tools of Constant Service

Manufactured by **Write for Catalog**

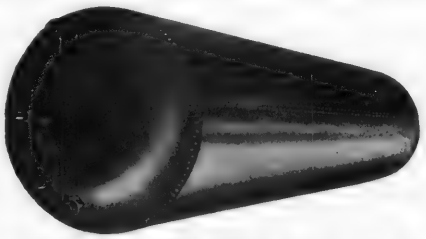
THE ARMSTRONG MFG. CO., 321 Knowlton St., BRIDGEPORT, CONN.

surface lines for the improper heating and ventilation of the cars. It is stated that the surface car company has agreed to operate "open air" cars sufficient to meet the public demand; to install ventilating systems in some 1,500 cars now depending on natural ventilation; to furnish each car with a thermostat to keep the temperature at least as high as 50° F.; and to place at the disposal of the health department advertising space for the display of "healthograms." At present only half of Chicago's surface cars are equipped with mechanical ventilators.

Seattle, Wash.—As a part of the present heating system of the University of Washington, Professor E. O. Eastwood, consulting engineer of the university, is planning for the installation of a tunnel extending from the Mines Building to the heating plant to house the main trunk line of steam pipes. The cost of the project is estimated at $10,000. There is one large tunnel now, extending from Denny Hall to the Mines Building, which contains the pipes heating the upper section of the campus. Because of this tunnel it is easy to repair anything that may happen to the main pipe between these two buildings, but if a break occurs in the south end of the campus considerable time and money are required to repair it.

Chicago, Ill.—An indication of the interest being taken in Chicago in the matter of ventilation is shown by the following letter and answer which appeared in the Chicago *Tribune*. The letter, which was signed "Fresh Air Friend," asked: There is a live subject constantly discussed that we are all interested in, or should be, namely, to insure proper ventilation in our homes, offices and factories during the approaching cold season. Please state if our board of health furnishes any advice and gives any standard rules as to the necessary amount of fresh air required per so many cubic feet of space and how results can best be obtained, or where reliable and cheap literature on this subject can best be obtained." The reply, written by Chicago's Commissioner of Health, John Dill Robertson stated that "as the three types of buildings mentioned form three different and separate problems it is difficult to answer the inquiry in the space available. The ventilation of the home is in itself a very broad subject and must be considered in connection with the type of building—whether brick, frame, etc., and with the method of heating employed. To obtain an adequate air supply is the least difficult part of the problem. In the ventilation of the home the things to be chiefly considered are protecting the air supply from dust and dirt and maintaining a degree of humidity compatible with health and comfort. The Chicago commission on ventilation will have this subject up for consideration at the next meeting and it is probable that the report can be published and made available.

"While the ventilation of offices is somewhat similar to that of homes, the problem is different, in that the office location is liable to be in a congested and consequently dust laden portion of the city. A clean air supply and proper humidity is more difficult to obtain than in the outlying districts. It might be mentioned in this regard that the



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recognize the high character of our product by specifying "The Dahlquist Boilers" on their most exacting work.

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39 Cortlandt St., New York
Boston Philadelphia Buffalo Chicago

use of windows is restricted owing to the cold drafts produced when they are open, and also to the fact that the noise from the street and possibly building operations in the vicinity prevent their general use. Factory ventilation is a subject that has been given considerable study and attention and the requirements as outlined in the Chicago building code are reasonable and explicit. The cubic space required, the amount of fresh air per person per hour, as also the temperature and humidity requirements will be obtained from the ordinances mentioned. The health department has not up to the present time published any literature on this subject."

John A. Stevens, Lowell, Mass., announces the removal of his engineering offices from 107 Merrimack Street to 8 Merrimack Street, Lowell.

James Cole Roberts, of the United States Bureau of Mines, Denver, Colo., has been elected to the Joseph Austin Holmes professorship of safety and efficiency engineering at the Colorado State School of Mines. Mr. Roberts assumed his duties November 1.

American Institute of Metals and the American Foundrymen's Association announce that their 1916 convention will be held in Cleveland, O., during the week of September 11, 1916. The exhibition will be held in the Cleveland Coliseum, where 60,000 sq. ft. of floor space on one level will be available.

Chicago, Ill.—Fresh air surface cars are being tried in Chicago by attaching one such car to each elevated train. Ventilation is provided by removing the small glass panels over the windows proper. At first, trouble was experienced with passengers who failed to note the sign on the car. One passenger after another, feeling the air, checked it by pulling down the window curtains. Five other cars were then run with all the windows removed. It will be recalled that the Erie Railroad Company tried a similar experiment on some of its suburban trains running out of Jersey City. At first the experiment was a pronounced success, but after a few nights, when the temperature was lower than usual, the "fresh air" cars were avoided and the railroad company then abandoned the scheme.

Building Operations for September, 1915, continued the good showing of the previous month, being 32% in excess of those for the corresponding month in 1914. Of the 56 cities tabulated, 46, or more than two-thirds, made gains over the corresponding period of last year and many of the gains are large. Dayton, for instance, showed an increase of 349%; Washington, 374%; Indianapolis, 205%; Newark, 186%; Philadelphia, 162%. The figures for New York City were $10,813,730, as compared with $11,619,179 a year ago, a decrease of 7%. Chicago's increase was 74%, from $4,925,000 in September, 1914, to $8,569,600 this September.

National Association of Sheet Metal Contractors, through its warm air heating com-

Jenkins Bros. Hose End Valves

Particularly adapted to fire protection service because they are fitted with Jenkins Bros. Discs of soft flexible rubber composition, forming seat and making the valves absolutely tight under cold water pressures. The discs never stick nor corrode, and valves are at all times ready for instant service. Various styles. Write for catalogue No. 20.

JENKINS BROS.

New York Boston Philadelphia Chicago Montreal London

SPECIFY FOXBORO THERMOMETERS

TRADE MARK

THE FOXBORO COMPANY Succeeding The Industrial Instrument Co.

New York Chicago FOXBORO, MASS., U. S. A. San Francisco St. Louis

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

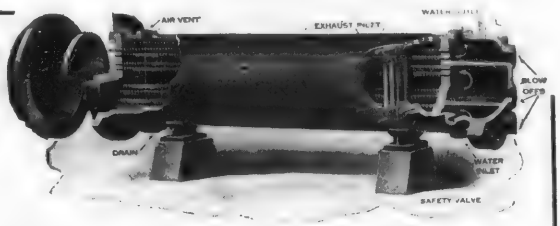
mittee, has written to all of the local associations, urging them to secure action by their municipal authorities in adopting a code for warm air heating installations. The committee, in its letter, calls attention to the successful working of the "Omaha Code," which has been in effect in Omaha for nearly a year and a half. While modifications may be needed in other localities, the committee states that the use of the code in Omaha proves that home builders are strong for it. Copies of the "Omaha Code" are supplied by John H. Hussie, chairman of the committee. The address of the secretary, Edwin L. Seabrook, is 261 South Fourth Street, Philadelphia, Pa.

Carrere & Hastings, architects, New York, are now located in their new quarters in the Vanderbilt Concourse Building, 52 Vanderbilt Avenue.

Central Supply Association, at its recent annual meeting, re-elected C. V. Kellogg, of the Kellogg-Mackay Co., Chicago, president. Other officers elected are: First vice-president, A. A. Merkel, Merkel Bros. Co., Cincinnati, O.; second vice-president, L. C. Huesmann, Central Supply Co., Indianapolis, Ind.; treasurer, Edward F. Niedecken, Hoffman & Billings Mfg. Co., Milwaukee; secretary, Paul Blatchford, 1915 City Hall Square Building, Chicago. Members of executive committee: C. V. Kellogg, P. J. Frey, Central Supply Co., Minneapolis; A. A. Merkel, Edward F. Niedecken, A. B. Pierce, N. O. Nelson Mfg. Co., St. Louis; George H. Gorton, W. B. Young Supply Co., Kansas City, Mo.; J. B. Rahm, United States Supply Co., Omaha; J. D. Tschopic, Standard Sanitary Mfg. Co., Pittsburgh, and L. C. Huesmann. National committee: J. J. Ryan, J. J. Ryan & Co., Chicago; W. A. Myler, Standard Sanitary Mfg. Co., Pittsburgh; John F. Wolff, L. Wolff Mfg. Co., Chicago; F. D. Keeler, Rockford Brass Works, Rockford, Ill.; and J. P. Hartnett, L. M. Rumsey Mfg. Co., St. Louis. Delegate to the Chamber of Commerce of the United States, George H. Bailey, Bailey-Farrell Mfg. Co., Pittsburgh; alternate, Theodore Ahrens, Standard Sanitary Mfg. Co., Pittsburgh.

R. D. Hopkins, consulting engineer for heating and plumbing, etc., who recently returned to this country after a stay of three years in China where he was engaged in the design and installation of the mechanical equipment for the Bureau of Engraving and Printing, will return to that country, leaving New York December 1. In addition to work in connection with new projects of the Chinese government, Mr. Hopkins will act for a number of American manufacturers and expects to stay in China indefinitely. His headquarters will be in Tientsin.

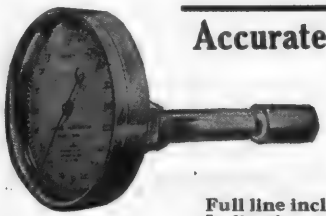
Correct Engineering Principles
are followed in the construction of the
ALBERGER MULTI-HEAD WATER HEATERS
Horizontal or Vertical



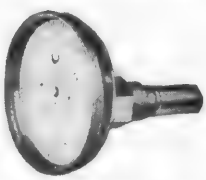
Proper provision is made for expansion and contraction of the tubes. Built of the highest grade materials, consisting of pure copper and cast-iron.

For boiler feed water, gravity and forced circulation heating systems, hot water service for domestic purposes, etc. Catalogue on request.

ALBERGER HEATER COMPANY, BUFFALO, N. Y.
CHICAGO, ILL.



Accurate Service Is Assured When You Use
Standard Indicating and Recording Thermometers
Guaranteed Correct



Full line includes seven types of recording thermometers and a special line for mechanical uses
Indicating mechanical thermometers are furnished with extensions from 2 to 30 in. in length
All thermometers are double and not breakable.

STANDARD THERMOMETER COMPANY Clinton and Shirley Streets **BOSTON, MASS**

Better Valves

Detroit Packless Radiator Valves were designed to meet the demand for better valves.

They have proved to be better in every way—they are absolutely tight and will stay tight—they do not leak around the stem nor need repacking.

The installation of Detroit Packless Valves means economy and permanent satisfaction for the building owner.

Detroit Packless Radiator Valves

are being specified in prominent buildings throughout the country because they meet that all-important requirement of maximum utility combined with beauty of line and finish.

The first cost is the whole cost—there is no occasion for having a man spend most of his time keeping them in condition, and there is no danger of their becoming unsightly from rusty, dirty water.

Their lines are substantial, symmetrical and pleasing.

The metal surfaces have a smooth satin finish that will not deteriorate—the handles are mahogany finish, large and nicely proportioned. In fact, Detroit Packless Valves are finished in a manner to harmonize with the most beautiful surroundings.

And the line is complete—angle—corner—globe—gate—in all sizes for every kind of installation on steam and hot water systems.

Illustrated Booklet V-46 gladly sent on request.

"A Radiator Valve That Can't Leak"

Equipped with Genuine Detroit Packless Radiator Valves.

DETROIT LUBRICATOR COMPANY
DETROIT, U. S. A
CANADIAN DETROIT LUBRICATOR COMPANY, LTD. WALKERVILLE, ONTARIO.

Makers of the Stewart Carburetor

EQUITABLE BUILDING, NEW YORK
Architect, Ernest R. Graham
Heating Contractors, Thompson-Starrett Co.

Gas Producer Power Plants in New York City and Vicinity was the the subject of an address by Charles M. Ripley before The American Society of Mechanical Engineers in New York, November 9. The address took up the question of the individual power plant versus the central station plant for power purposes.

Calor Vento Club, Inc., 845 Broad St., Newark, N. J., states that it will be pleased to receive circulars, catalogues and other data from manufacturers of heating and ventilating apparatus, for filing in its information bureau. This organization was formed in April, 1914, the members all being engaged in the heating and ventilating business. They are also members of the master steam fitters' association. The object of the club is the advancement of the business, as well as the assistance and protection of its members in all matters pertaining to their particular line, and the improvement of the class of service rendered.

P. M. Beecher, formerly second vice-president of the Pierce, Butler & Pierce Mfg. Corporation, Syracuse, N. Y., has resigned to accept the office of vice-president of the Richmond Radiator Co., New York. Mr. Beecher's headquarters hereafter will be in New York, where he will have charge of the sales department of the Richmond company. Mr. Beecher was connected with the Pierce, Butler & Pierce Mfg. Co. since 1879, a period of 36 years. As a result of the reorganization of the company a year ago, Mr. Beecher was again made vice-president and had charge of the company's Syracuse office.

Central Station Heating Notes.

Ritzville, Wash.—A proposed franchise ordinance has been presented to the authorities in Ritzville in the interest of the Ritzville Central Heating Company, to operate a district heating system in that city. The proposed ordinance would grant a 25-year franchise for the furnishing of heat and electricity. The company proposes to install a plant valued at $6,000 and to supply service to the business district. The company is willing to pay 1% of the gross income to the city for the franchise. A permit was granted for the installation of the first part of the system, and a council committee, consisting of Councilmen C. W. Rathbun, A. L. Wiffin, W. H. Kreager and City Attorney J. Oscar Adams, was appointed by Mayor Shepley to consider the matter.

Webster Air Conditioning Apparatus

Webster Air-Conditioning apparatus is constantly demonstrating its capacity, under a wide variety of exacting conditions, to effect and maintain any desired temperature and humidity.

Wherever a highly efficient and thoroughly dependable air-cooling or air-conditioning system is required, Webster apparatus, by reason of exclusive advantages, merits unquestioned consideration.

Widely installed in hotels, restaurants, office and administration buildings, as well as industrial establishments where special air-cooling and air-conditioning problems are to be met.

Our catalogues and engineering force are at your command.
We guarantee results.

WARREN WEBSTER & CO.

ESTABLISHED 1888 — **CAMDEN, N. J.** — BRANCHES IN PRINCIPAL CITIES

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

Geology Building, University of Chicago. Holabird & Roche, Architects.

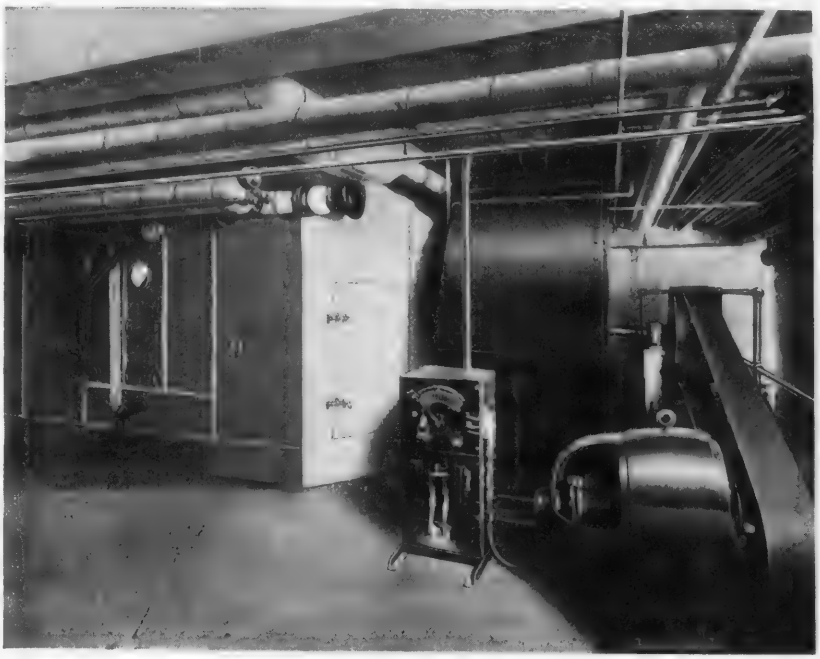
Sturtevant Air Washers
(REG. U.S. PAT. OFF.)

In University of Chicago

The Sturtevant Air Washer in the above building has a capacity of 31,000 cu. ft. per minute, and piping connections are so made that each independent row of spray heads may be shut off independently of all others. The washer is fitted with both atomizing and rain type nozzles.

Prominent architects and engineers realize the advantages of Sturtevant Air Washers and specify them in spite of the fact that they are by no means the cheapest. Sturtevant Washers are installed in:

Kansas City Union Terminal
Wellesley College Dormitory, Wellesley, Mass.
U. S. Custom House, Baltimore
Cleveland City Hall
Miami Hotel, Dayton
Allegheny Carnegie Library
Deshler Hotel, Columbus, O.
and others.



Our Air Washer Department is prepared to handle all problems in air washing and air conditioning. Write.

B. F. STURTEVANT CO.

Hyde Park
Boston, Mass.

And All Principal Cities of the World

Lykens Valley Light & Heat Co. has applied to the State Department for an increase in its capital stock from $47,000 to $600,000 and an increase in its bonds from $100,000 to $1,100,000.

Oshkosh, Wis.—The first commercial central heating plant for residences to be installed in Oshkosh, has just been completed by August Pitz. The plant, which furnishes heat to six residences, is built on the rear of one of the lots at Union Street and Wisconsin Avenue. The buildings supplied are all owned by Mr. Pitz and are near each other. It is stated that the installation of similar plants is being considered by several groups of people in the same locality.

Tacoma, Wash.—A delay in the starting of construction work for the new central heating plant in Tacoma, for which a franchise was granted to the Tacoma Central Heating Company, of that place, has brought out the fact that the company must expend at least $25,000 on construction work by March 17, 1916, in order to retain its franchise. Under the franchise agreement the company is not obligated to have the plant completed at any specific time, the guarantee being limited to the expenditure of $25,000 by the date stated. It was said that some of the promised capital of the company had been withdrawn and also that the business men of Tacoma had been slow to sign up for the heating service. Even if work were begun at once, it would be next winter before the plant would be in operation.

New Firms and Business Changes.

Peck-James Thermos Co., San Francisco, Cal., is the title of a new firm organized to deal in heating apparatus and to install heating systems. Quarters have been opened at Pine and Battery Streets, in charge of George D. Peck, formerly of the Pressed Metal Radiator Co., who is the manager of the new company.

Anson-Byrne Co., 10 South La Salle St., Chicago, Ill., is the changed name of the Maher & Byrne Co., manufacturers' agents.

J. H. Buckley Co., New Haven, Conn., heating and plumbing contractors, whose offices were located for 37 years at 179 Church Street, has recently moved to new quarters at 14-18 Whitney Avenue. President, Edward M. Cotter; secretary and treasurer, T. C. Fowler.

Lingley-Holloway Co., 14 Medford St., Boston, Mass., contractors for power, heating and ventilating work, has succeeded to the business of C. H. Sanborn.

New Incorporations.

Air Control Corporation of New York, New York, capital $10,000, to manufacture and deal in ventilators, weather strip, etc. Incorporators: F. H. Lee, Summit, N. J.; F. I. Quick, 259 West 130th St., New York; G. R. Seifken, 1222 Evergreen Ave., New York.

Bacon Heater Mfg. Co., Cleveland, O., capital $10,000, to deal in heaters. Incorporators: J. W. Sturtevant, Joseph H. Bacon, C. H. Bell, Jr., and Marvin J. Bacon.

Efficiency Heater Co., Piqua, O., capital $150,000, to manufacture warm air furnaces and accessories. Incorporators: H. D. O'Neall, Eugene Johnson, H. L. Richards, W. Z. Burton and J. L. Murray.

McCormick Plumbing Supply Co., Detroit, Mich., capital $15,000, to conduct a supply business in heating and plumbing goods. Stockholders: James C., Belle and Dorothy McCormick.

Carroll Plumbing & Heating Co., Detroit, Mich., capital $1,000, to conduct a general heating and plumbing business. Stockholders: Ellsworth E. Carroll, George F. and J. S. Bamlet and B. F. Mulford.

Vent-Lite Shade Co., New York, capital $10,000, to manufacture and sell shade adjusters, ventilating appliances, etc. Incorporators: Jacob W. Winker, Walter B. Hopping, Arthur E. Luzzi, 239 West 109th St., New York.

Universal Heater Co., Cleveland, O., capital $25,000. Incorporators: R. W. Daykin and others.

A. Y. McDonald Mfg. Co., Dubuque, Ia., capital $750,000, to manufacture pumps, plumbing supplies, etc. President, A. Y. McDonald; vice-president, J. M. McDonald; secretary, Ira G. Whitney; treasurer, Mary M. McDonald.

Hoffman Plumbing & Heating Co., Columbus, O., capital $10,000. Incorporators: A. W. S. Hoffman, Arthur B. Wolfe, Frank J. Hillay, John F. Fergus and C. C. Zurhorst.

Roxbury Furnace & Heating Co., Boston, Mass. President, Solle Stiller; secretary and treasurer, Benjamin Cohen.

Riverside Engineering & Supply Co., New York, capital $15,000, to deal in heating and plumbing specialties. Incorporators: W. A. Vanness, R. A. McEntee, and J. W. Tracy, all of 70 West 107th St., New York.

Berryman Water Heater Mfg. & Sales Co., Jersey City, N. J., capital $2,000, to manufacture water heaters. Incorporators: A. L. Wannerstone, Brooklyn; J. T. Booth,

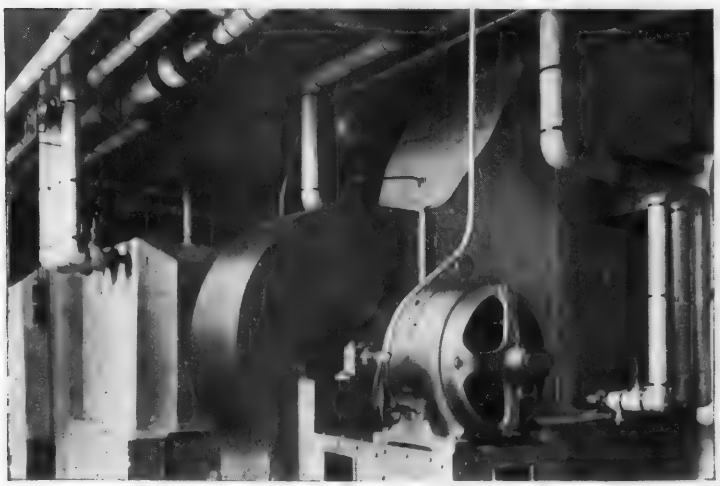
Panorama view of the Cincinnati new General Hospital.

Sturtevant (REG. U. S. PAT. OFF.) Apparatus in Cincinnati

This municipal hospital is one of the finest and most modern institutions in the world. The good points of all the best hospitals in United States and Europe are embodied in its making.

This institution is equipped with 33 motor-driven Sturtevant Fans with combined air capacity of more than a quarter of a million cubic feet. They vary in size from Sturtevant Ready-to-Run Portable Ventilating sets, delivering 500 CFM to No. 8 Multivane Fans delivering 13,000 CFM.

The fans are direct connected to Sturtevant direct current electric motors. The largest motor is of nominal size, 10 HP.



Apparatus for supplying fresh air to operating pavilion.

Our engineers will be glad to co-operate with Heating and Ventilating Engineers and to submit plans and specifications. Our Air Washer Department is prepared to handle all problems in air conditioning.

B. F. STURTEVANT COMPANY

Hyde Park, Boston, Mass.

And All Principal Cities of the World.

New York, and L. V. Hulse, Hoboken, N. J.

Freville-Pratt Co., Chicago, Ill., capital $30,000, to take over the steam specialty business of the J. J. Reilly Mfg. Co., whose capital stock was $50,000.

Simmons Forced Draft Co., Goldsboro, N. C., capital $125,000, to manufacture heating and ventilating specialties. Incorporators: Nathan O'Berry, George S. Dewey and L. H. Simmons.

Eastern Plumbing Supply Co., Chicago, Ill., capital $2,000, to deal in heating and plumbing specialties. Incorporators: Robert L. Hunter, Joseph Boozel and A. Schultz.

Fair Ventilator Co., Detroit, Mich., capital $50,000, to manufacture ventilating systems. Incorporators: Charles J. Stodgell, A. R. Mason and George A. Fair.

Struble Bros. Co., Wilkensburg, Pa., capital $10,000, to conduct a heating and plumbing business. Incorporators: J. J. Struble, C. L. Struble and Howard F. Struble.

Business Troubles.

Southern Heating Co., Memphis, Tenn., has filed a voluntary petition in bankruptcy. The company's liabilities are scheduled at $12,479 and its assets at $9,914.

Business Chances.

Washington, D. C.—Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, for the following named work:

Until Dec. 10, 1915, for the construction complete, including mechanical equipment, of the U. S. Post Office at Greenwich, Conn. One story and basement, 8,550 sq. ft. ground area.

Until Dec. 18, 1915, for the construction complete, including heating apparatus, plumbing, etc., of the U. S. Post Office at Middletown, O. Two stories and basement, 6,291 sq. ft. ground area.

Until Dec. 21, 1915, for the construction complete, including mechanical equipment, of the U. S. Post Office at Humboldt, Tenn.

Until Dec. 21, 1915, for the construction complete, including mechanical equipment, of the U. S. Post Office at Attleboro, Mass. One story and basement, 7,264 sq. ft. ground area.

Until Dec. 22, 1915, for the construction complete, including mechanical equipment, of the U. S. Post Office at Aurora, Neb.

Until Dec. 28, 1915, for the construction complete, including mechanical equipment, of the U. S. Post Office at Seymour, Conn. One story and basement, 5,050 sq. ft. ground area.

Until Dec. 29, 1915, for the extension, remodeling, etc., of the U. S. Post Office and Court House at Missoula, Mont. Extension four stories and basement, including addition of a fourth story to present building.

Until Dec. 30, 1915, for the construction complete, including mechanical equipment, of the U. S. Post Office at Ridgeway, Pa. Two stories and basement, 4,128 sq. ft. ground area.

¾H.P.Equipment

Spencer Turbine Vacuum Cleaners
are manufactured in sizes from ¾ H. P. to 40 H. P.
Send for catalogue
SPENCER TURBINE CLEANER COMPANY
HARTFORD, CT.

RELIABLE
Vacuum and Vacu-Vapor Heating Equipment is Really RELIABLE
The BISHOP-BABCOCK-BECKER CO.
Manufacturers, CLEVELAND, O.

Sirocco

TRADE MARK

Fan Systems

Lord, Hewlett and Tallant, Architects.
Griggs and Holbrook, Engineers, New York, N. Y.

The Brooklyn Hospital, Brooklyn, N. Y.

where efficiency—Smooth and Quiet operation of all equipment is demanded, Sirocco Fans were chosen by the Architects and Engineers to provide for the ventilation.

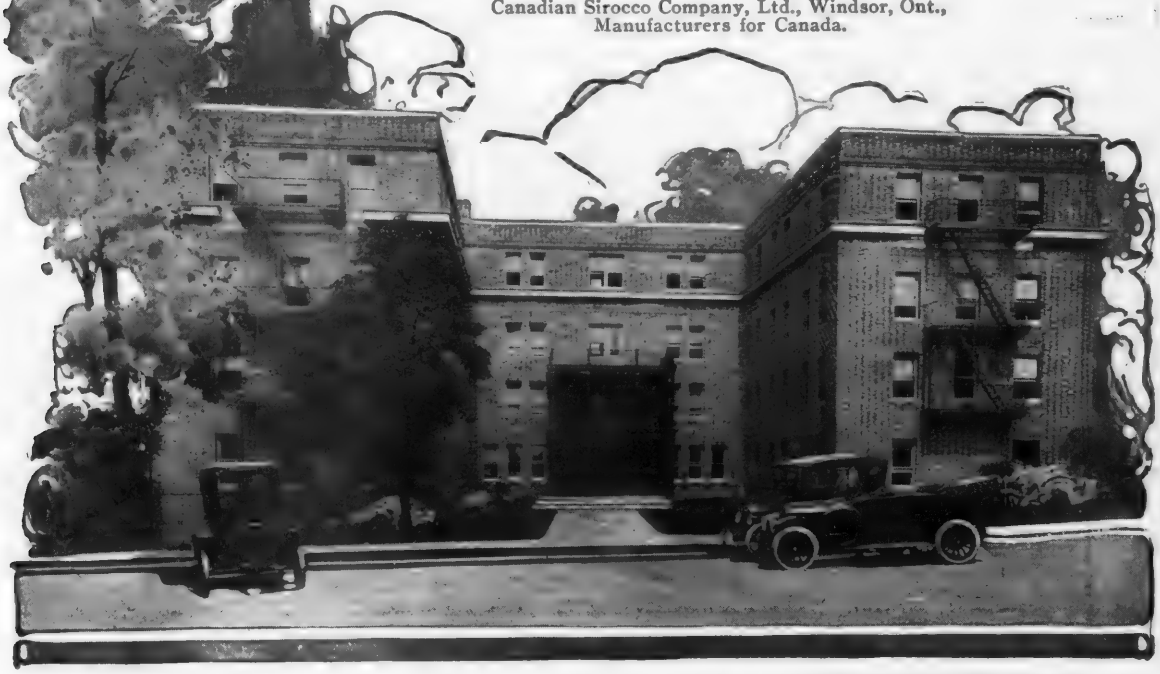
The presence of these qualities in Sirocco Fans denotes **proper design and construction** for any duty where air is to be handled.

Have you our catalogues on file? They're standard size. If you haven't a set, your request will bring one immediately. Ask for No. 109.

AMERICAN BLOWER COMPANY

DETROIT. MICHIGAN. U.S.A.

Canadian Sirocco Company, Ltd., Windsor, Ont., Manufacturers for Canada.



Contracts Awarded.

(Where bids for heating and ventilating equipment do not exceed $2,000, the work is usually well under way by the time the item is published in this column. Such items are only intended to give our readers a line on the activities of the trade.)

B. McKenzie, Greensboro, N. C., steam heating East Bragg Street School, East Eashing Street School, South Spring Street School and Cypress Avenue School at Greensboro.

Pittsburgh, Pa., bids were received as follows for the heating, ventilating and plumbing of the city hall and court house building in Pittsburgh:

P. J. Dowling & Co., Spokane, Wash., heating and plumbing $100,000 monastery at Mission and Dakota Streets, Spokane, for $7,000.

Ideal Heating & Construction Co., Davenport, Ia., heating and plumbing new Y. M. C. A. building at Dubuque, for $11,000. Work was started November 1.

Schofield & Cowl, Wheeling, W. Va., heating new school building at Wheeling.

W. J. Scholl Co., Youngstown, O., heating and plumbing new Tod House in Youngstown, for $50,000.

Hitchcock Bros. Co., Peoria, Ill., heating and plumbing Christian Science Church for $7,000; also heating and sprinkler

HEATING AND VENTILATING.

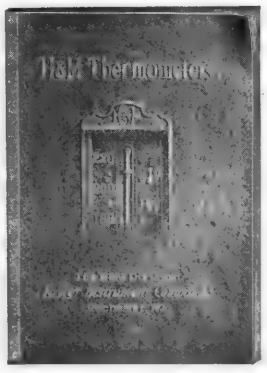
	A	B	C	D
Baker, Smith & Co., Pittsburgh	$135,950	$135,000	$139,000	$137,500
F. E. Geisler Co., Pittsburgh	144,400	142,880	147,290	145,805
The McGinniss Co., Pittsburgh	148,148	146,539	148,943	147,793
Thompson-Starett Co., Pittsburgh	155,960	154,762	158,536	157,557
Hanley-Casey Co., Chicago	156,780	155,100	159,500	158,000
Fitzpatrick-Hoepfner Co., Columbus	156,971	155,771	161,971	160,971

A—Per specification. B—Steel pipe. C—Extra heavy wrought iron pipe. D—Extra heavy steel pipe.

PLUMBING.

	Per Spec.	A	B	D	E	Vacuum Cleaner	Sterilizer
E. R. Schollenberger, Hamburg, Pa.	$161,000	$148,400	$149,600	$157,200	$161,800	$5,400	$3,700
Weldon & Kelly, Pittsburgh	165,500	151,256	152,345	161,990	166,459	5,300	3,700
W. N. Sauer, Pittsburgh	174,776	161,428	158,024	170,405	175,784	6,895	3,589
Geo. H. Soffel Co., Pittsburgh	175,700	160,638	164,281	170,639	176,514	4,900	3,500
Buerkle Plumbing Co., Pittsburgh	190,542	178,240	172,807	186,636	191,750	3,190	3,408

A—Galvanized iron pipe. B—Cast iron pipe. D—Steel pipe. E—Wrought iron pipe.



Books on Temperature Measuring Instruments for Industrial Purposes.

Covering Steam and Power Plants, Heating and Ventilating, Marine Engineering.

Covering Industries in which the primary condition of use is steam under pressure.

Covering Ice Manufacture, Refrigeration, Cold Storage and those Industries where the primary requirement is low temperature.

Covering Gas Works, By-Product Coke Ovens and Gas Power Plants.

We will send you a copy of any of the above works FREE, or if none of them meet the requirements of your business, write us what your Temperature Measuring problem is, and we will send you information covering it, no matter how difficult, or varied the conditions to be met may be.

The H&M Division
Taylor Instrument Companies
Rochester, N.Y.

Johns-Manville Service is an evolution—the growth of half a century's endeavor to insure permanent satisfaction to users of J-M Products, of whatsoever kind. The sale of an article is not the end, it is really the beginning of J-M Responsibility.

Look into the J-M Steam Trap

What do you see? Just the Ball. That's all. No lever, diaphragm or valve. Nothing to bind—nothing to break. Can't get out of order. Notice how heavy the flanges and body are. Made extra strong to stand extra strains.

The J-M Trap will discharge water and air as fast as collected without loss of steam. The Ball is simply rolled from its seating by the water. Air as well as water is instantly discharged. The Ball then rolls back onto its seat. This rolling action distributes wear over entire surface of ball, rendering wear at any point so slight as to make trap practically everlasting without repairs.

Made in all sizes for all pressures. Highly efficient on grease and oil separators and for vacuum systems.

Installing J-M Sectional Conduit at State School of Mines, Rapid City, So. Dak.

For high pressure steam distribution or low pressure heating
J-M SECTIONAL CONDUIT

It is the most definite system of underground distribution there is. Definite because its efficiency is known to be 90% or more based on the saving over bare pipe. Definite, too, because every detail in underground transmission practice has been met in the structural details of its design and in the materials employed.

We do not argue that there are no other systems that will transmit steam or other fluids underground but we can prove to any one interested that for mechanical durability, maintenance and thermal efficiency and from an investment viewpoint that it is the system where a dollar spent goes furthest in ultimate economy.

Better get the booklet that gives all the facts.

H. W. JOHNS-MANVILLE COMPANY
New York and all Large Cities

462

equipment for the Oalsford & Fahnestock building ($13,000), and the plant of the Keystone Steel & Wire Co. ($6,700).

J. M. Shea & Co., Peoria, Ill., heating county jail building for $4,400. The plumbing contract went to Thomas J. Cody, Peoria, at his bid of $8,887.

Otto Wurm & Co., Detroit, Mich., heating new Masonic Temple in Highland Park.

John W. Clegg & Son, Ottawa, Ill., heating and plumbing La Salle County Detention Home for $9,000; also installing 2,000 ft. of 6-in. water main for the city at $3,060.

J. M. Dougherty, Ottawa, Ill., heating and plumbing new armory building in Ottawa, for $5,500.

W. G. Cornell Co., New York, heating and plumbing new Terminal Building for the Public Service Corporation, in Newark, N. J.

W. C. Boyd & Co., Louisville, Ky., heating and ventilating colored high school building in Louisville, for $9,779. It is stated that on account of the continued congestion of some of the schools in Louisville it is possible that a new bond issue will be made shortly to be devoted to the construction of additional school buildings.

A. W. Murray Co., Hoopeston, Ill., heating and plumbing high school building at Palestine, Ill., for $8,000.

O'Donnell-Barrows Co., Washington, Ind., heating and plumbing Elks' clubhouse in Washington, for $2,385.

Frontier Plumbing & Heating Co., Buffalo, N. Y., heating St. Andrew's Roman Catholic Church in Buffalo. A vapor system will be installed.

J. Young Plumbing Co., Parkersburg, W. Va., heating County Infirmary building at that place, for $2,893; the plumbing contract went to the East End Plumbing Co., Parkersburg, at its bid of $1,557.

Frank P. Walsh, San Francisco, Cal., was low bidder for construction and the installation of boilers, piping, pumps, heaters, etc., for the oil storage station at the United States Navy Yard, at Mare Island. The buildings and equipment will cost $258,225.

H. G. Post, Los Angeles, Cal., heating and plumbing Murphy Oil Building at Whittier, for $3,880.

Weyant Plumbing & Heating Co., Lincoln, Neb., heating and plumbing Bessey Botannical and Zoological Buildings at the University of Nebraska. Heating and ventilating contract, $11,979; plumbing contract, $10,841.

E. B. Hughes, Gooding, Idaho, heating and plumbing Elmore County Court House, at Mountain Home, Idaho, for $3,685.

J. A. Scherer, Seattle, Wash., heating $150,000 Home Economics Building at the University of Washington, Seattle, for $12,029; the plumbing contract was awarded to the Rautman Plumbing & Heating Co., Seattle, at $12,823.

Dupar Bros., Bellingham, Wash., heating and ventilating addition to the State Hospital for the Insane at Norlun, for $11,300. The plumbing contract went to D. H. King, Seattle, at his bid of $9,677.

C. S. Eames & Co., Bridgeport, Conn., heating and plumbing addition to the building of the Southern New England Telephone Co., in Bridgeport. The addition will cost $95,000.

Walker L. Owen & Co., Harrisburg, Pa., heating and plumbing twelve brick and stucco houses at Fourth and Hamilton Streets, Harrisburg, for Dr. B. S. Behney.

Norton & Smith, Seattle, Wash., heating Detention Home for the U. S. Immigration Bureau, for $2,192. The plumbing contract went to W. A. Whipple & Co., Seattle, at their bid of $3,975; also heating Jefferson Park Golf Club House for the Seattle Park Board.

TURBINE VACUUM and AIR LINE PUMPS

JUST WHAT YOU HAVE BEEN LOOKING FOR

A vacuum pump and motor mounted on one base and direct connected. **HAS NO** gears, belts, pulley plungers, valves or other complicated parts in its construction. It is the simplest and most positive vacuum pump yet invented.

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CHICAGO PUMP CO., 907 W. Lake St., Chicago

Manufacturers of Bilge and House Pumps, Sewage Ejectors and Condensation Pumps and Receivers

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

No. 2
Riser Type

THE AIR MOISTENER CO.

Call attention to a new and valuable type of the Steamo Air Moistener for attachment to steam risers. It is a very useful type and you should know about it.

Made in a variety of sizes and kinds for all purposes.

There is now no reason why all heating plants should not be designed to embrace the great advantage of humidity, or existing steam plants amplified.
Descriptive matter and prices on request.

THE AIR MOISTENER CO.
28 North Market Street,
Chicago, Illinois

The Mouat Vapor Heating System

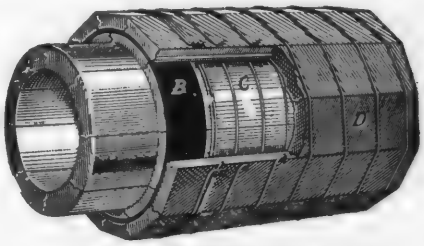
First Choice for Architects' Homes.

The character of the Mouat Graduating Vapor Heating System is shown by the class of homes and buildings in which it is being used. Almost always when the main object is to obtain the best system that money can buy, the Mouat system is purchased. Architects, whose homes are recognized as being models in appointments as well as design, almost invariably specify this system for their own homes—among this number are seven prominent Cleveland architects.

This success is not due to any one device, but to the combined operation of several exclusive features. Heat is furnished very quickly in times when most needed and in **any amount** to suit weather conditions or individual ideas. It affords **independent** heat regulation in **each room** and **positive graduating is guaranteed.**

Plumbers and steam fitters who would like to be benefited by obtaining full information regarding this system, write for our special booklet **Today.**

Manufactured by
The MOUAT SQUIRES Co.
Cleveland, O., U. S. A.
At 1244 W. 4th St.



A—Inner Shell, 2 inches thick.
B—Asphaltum Packing.
C—Dead Air Space.
D—Outer Shell, 1 inch thick.

Cover Your Steam Pipes

WITH WYCKOFF'S IMPROVED

CYPRESS COVERING

Made of Gulf Cypress, the wood eternal

Not affected by wet and dry conditions common to steampipe trenches. Will not rot. Lasts twice as long as Pine Casing. Absolutely water and steam tight. Each shell is wound with heavy galvanized wire. Coated all over with the best known preservative—Hydrolene B.

Let us answer your questions and tell you all about it. Booklet on request.

A. WYCKOFF & SON COMPANY

ELMIRA . . N. Y.

Chicago, Ill., 551 West 14th Place

L. A. Horner, Eureka, Mont., heating and plumbing Masonic Temple, in that city.

Portland, Ore.—Bids for installing a central heating plant for the Franklin High School were received as follows: Rushlight & Hastorf, $21,867; J. F. Shea, $23,728; W. G. McPherson Co., $24,302; Appling-Griggs Co., $24,400; Alaska Plumbing Co., $23,776, and Kendall Heating Co., $25,275. As the award was about to be made the firm of Rushlight & Hastorf asked to withdraw its bid on the ground that an error was made in the tabulation of the figures. It was stated by D. C. Rushlight that the stenographer or bookkeeper, in adding up the figures for the bid, omitted an item of $2,325. When the bids were opened it was found that Rushlight & Hastorf were $1,861 lower than the next lowest bidder. In April last a similar circumstance arose when Martin Clancy was low bidder on the contract for the Kennedy School. His bid was $26,432 and the next lowest bid was $27,785. Clancy said he had made an error in his figures and asked to withdraw his bid and his check. The school board permitted him to do it. The board gave similar permission in the present case of Rushlight & Hastorf.

A. W. Schults, Detroit, Mich., heating, ventilating and plumbing new Montclair School, to be built at Montclair and Meadowbrook Streets, Detroit. The contract amounts to $20,709.

Smokeless Boilers for Burning Bituminous Coal.

A quotation from an address of L. P. Breckenridge before the Cleveland Engineering Society was published in last month's issue, to the effect that "I think that the manufacturers themselves realize that the next demand will be for smokeless boilers for small heating jobs. It may be from 20 to 150 H. P. on the horsepower basis, or heating buildings containing from 1,000 to 15,000 sq. ft. of radiation."

This recalls the fact that for the past five years the Kewanee Boiler Company has been manufacturing what is sold to the trade and advertised as a Kewanee smokeless boiler, which is a brick-set type, and rated to heat from 1,600 to 15,000 sq. ft. of steam radiation and from 2,600 to 24,500 sq. ft. of water radiation. Within the last two years this company has manufactured and sold the Kewanee smokeless boiler, portable type, which is made in sizes to heat from 1,000 to 20,000 sq. ft. of steam radiation and from 1,600 to 33,000 sq. ft. of water radiation.

Both types and all sizes of the company's smokeless boilers, according to tests, have proven their ability to burn the cheapest grades of soft coal smokelessly and without any unusual attention in handling, so that any impression that smokeless boilers of the size mentioned are not now being manufactured would not be warranted by the facts.

Manufacturers' Notes.

American Radiator Co., Chicago, Ill., declared the regular quarterly dividend of 1 1/3% on the preferred stock, payable Nov. 15; also a dividend of 4% on the common stock, payable December 31. An officer of the company is quoted as stating recently that "business in this country has improved noticeably the past few weeks, but the stimulus is too new for us to understand it thoroughly. We hope it is permanent and not another 'flash in the pan.' Our volume of domestic orders is satisfactory, but we cannot find out precisely what our foreign branches are doing."

Tillman Heating Devices Co., Indianapolis, Ind., manufacturers of hot water heating specialties, has increased its capital stock to $100,000.

American Radiator Co., Chicago, Ill., is undertaking some special research work in its laboratories in Buffalo, and L. C. Soule, of the company's Vento department, has gone to Buffalo, to take charge of these tests.

FOR SALE.

We offer the following quantity of Reading full-weight wrought-iron pipe:

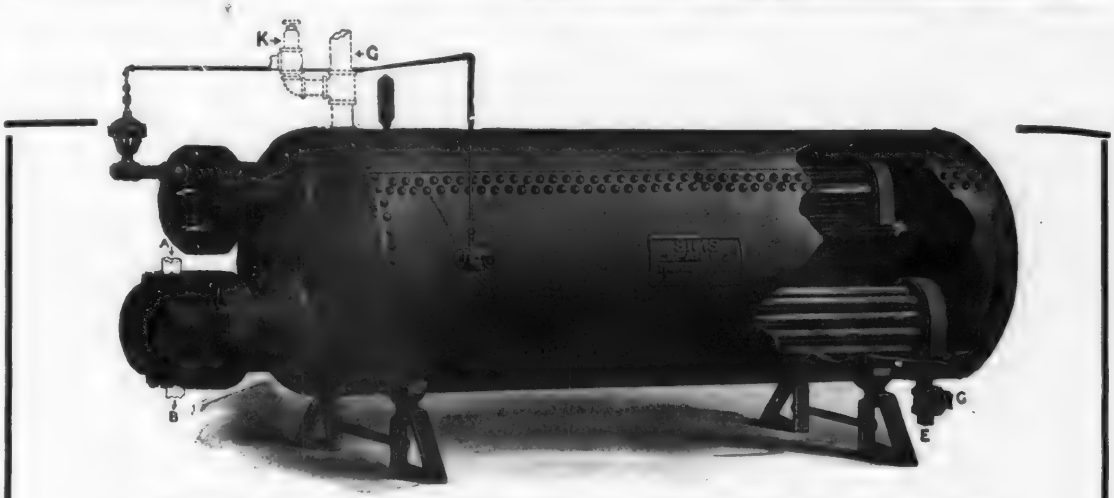
All in random 20 ft. lengths. Offers for all or part of this pipe will be entertained. Address, Eastman Kodak Company, Purchasing Department, Rochester, N. Y.

Number Feet.	Diameter, In.	Weight Per Foot.	Description.
700	8	28.81 Lbs.	Black
1,000	10	35.00 "	"
500	12	50.70 "	"
100	16	O.D. ⅜" thick	"
1,000	6	19.18 Lbs.	Galvanized
600	8	28.81 "	"

One-Half the Size— Double the Desirability.

More sensitive thermostatic control in the neat, inconspicuous Johnson Thermostat, which is less than half the size commonly in use—that is what you get in the new Johnson model thermostat. It is only two inches wide and less than five inches long—is responsive to slightest change in temperature, and is not affected by atmospheric pressure—has "open and closed" heat indicator, positive shut off, heat locking device, patented adjusting dial, and self-adjusting regulator.

Johnson Service Co.
Milwaukee, Wis.
Branch offices and service stations in all principal cities.



WHEN THE HOT WATER DEMAND RUNS HIGH

Our large experience in manufacturing heaters for laundries has developed the fact that there is not always enough exhaust steam to heat all the water to the temperature required. This is always the case with a wet-wash laundry. For a high hot water demand use the

SIMS CLEAN E-Z HEATER, TYPE D.

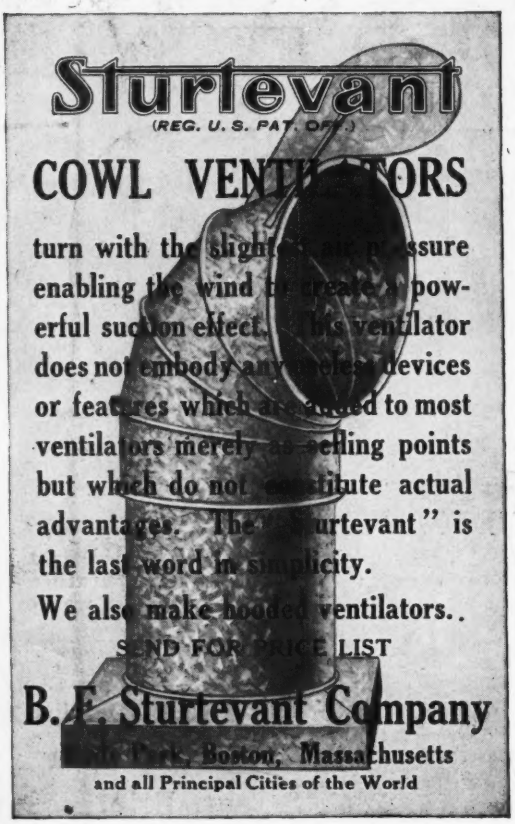
This heater is supplied with two sets of straight, seamless drawn brass tubes, the lower for exhaust steam, located in the coolest water. The upper set of tubes is for live steam direct from the boiler, controlled by a thermostat.

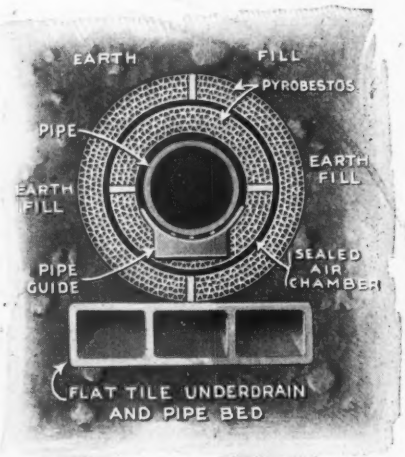
Our Bulletin HL-2 gives full particulars of Sims Heaters for laundries, hotels, hospitals and other service. Consultation free. All work guaranteed.

THE SIMS COMPANY **18th Street, Erie, Pa.**

Spray Engineering Co., Boston, Mass., reports that the two Spray Engineering Company air washers and coolers installed as auxiliaries to the 35,000 K.W. and the 30,000 K.W. steam turbo-generator sets in the new A-2 Christian Street station of the Philadelphia Electric Company, are the largest for any pair of units in the world. Other recent installation of the Spray air washers and coolers are the following:

	Capacity cubic feet per Minute
Lawrence Gas Co., Lawrence, Mass.	25,000
Lynn Gas & Electric Co., Lynn, Mass.	16,000
Cambridge Electric Light Co., Cambridge, Mass.	25,000
United Electric Light & Power Co., New York, three, each	50,000
National Conduit & Cable Co., Hastings, N. Y	25,000
Commonwealth Edison Co., Chicago, Ill., three, each	80,000
Consolidated Gas, Electric Light & Power Co., Baltimore, Md.	12,520
Merchants' Heat & Light Co., Indianapolis, Ind	72,000
Toledo Railways & Light Co., Toledo, Ohio.	70,000
Public Service Electric Company, Essex, N. J. two, each	60,000
North American Chemical Co., Bay City, Mich	30,000
Evansville Public Service Company, Evansville, Ind.	25,000
Eastern Penn. Railways Co., Palo Alto, Pa.	20,000
Minneapolis General Electric Co., Minneapolis, Minn.	50,000
New Orleans Railway & Light Co., New Orleans, La.	50,000
Mobile Electric Co., Mobile, Ala.	16,000


Sturtevant
(REG. U. S. PAT. OFF.)
COWL VENTILATORS
turn with the slightest air pressure enabling the wind to create a powerful suction effect. This ventilator does not embody any useless devices or features which are added to most ventilators merely as selling points but which do not constitute actual advantages. The "Sturtevant" is the last word in simplicity.
We also make hooded ventilators..
SEND FOR PRICE LIST
B. F. Sturtevant Company
Boston, Massachusetts
and all Principal Cities of the World



Pyro-Bestos Underground Pipe Insulation

For piping from central heating or power station to detached buildings of Universities, Asylums, Hospitals, Factories, etc. Also as underground Pipe Conduit for heating private Auto garages direct from House heating system. Lasts longer than Wood; in fact indefinitely. Easily applied and of reasonable cost. Is water repellant,—does not absorb moisture like Magnesia, Infusorial Earth or the loose filling in Tile Conduit systems, all of which materials acting like a wet sponge held against the piping soon rust holes in the piping. We have cases on record where Insulations of the absorbent type have totally destroyed the piping in five years and less after installation, making it necessary to go all over again with the cost of digging trenches, new piping and new Insulation. No material of an absorbent nature should be placed around underground piping. Test all underground Insulations offered you by placing a fragment in a glass of water. If it absorbs water, don't use it.

National Air Cell Covering Co.

210-220 Van Brunt St., Brooklyn, N. Y.

(*Opportunity Talks No. 9*)

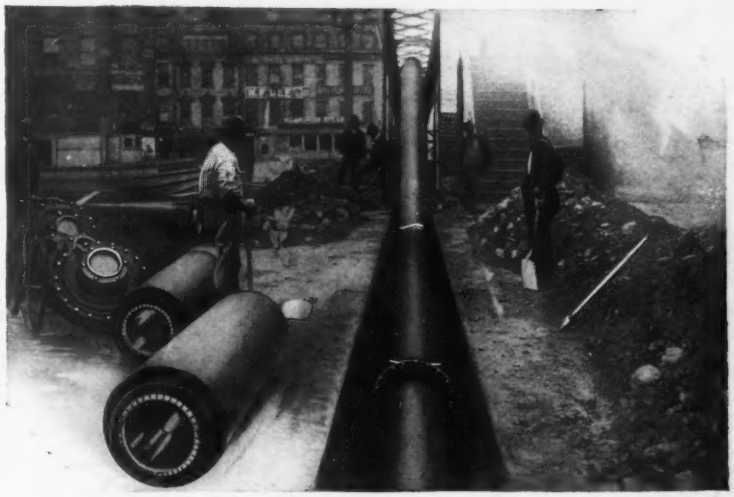
How Central Station Heating Service Keeps Out Competition in the Lighting and Power Field

The advantage to an electric company operating a heating plant, when in competition with other companies not so equipped, is important because such a company is then able to furnish the three most essential commodities—LIGHT, HEAT AND POWER.

Another advantage results from the fact that the electric company always sustains business relations with many of its prospective heating customers.

If there is not a central heating system in your city

This is Your Opportunity



Installing Steam Mains in New York State.

Heating by exhaust steam is a most efficient aid in securing electric light and power business now being served by isolated plants. For example, in a city in the Middle West, there were in operation recently a great many isolated plants. The public service company installed a modern central station heating system and, as a direct result of their ability to furnish heat, they were able in less than one year to secure the electric business of all but two of the isolated plants.

Send for further facts and information covering your particular conditions, or ask to have one of our engineers call on you.

AMERICAN DISTRICT STEAM COMPANY

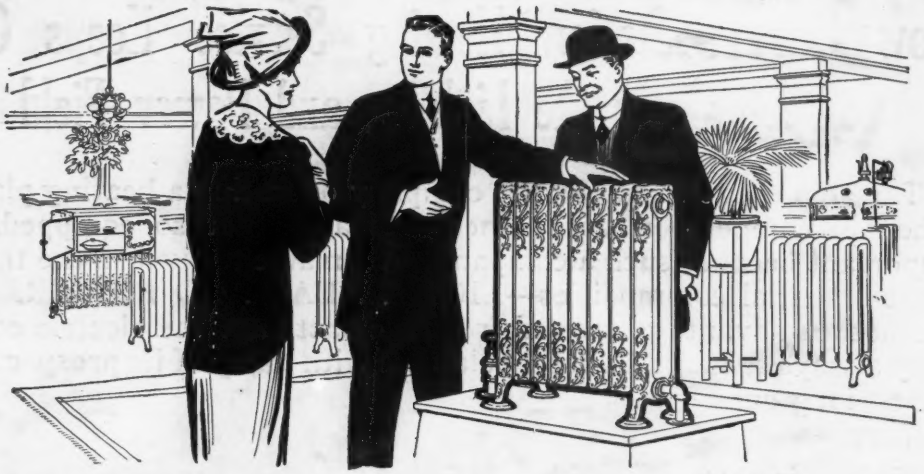
General Offices and Works: NORTH TONAWANDA, N. Y.

NEW YORK
West Street Bldg.

CHICAGO, ILL.
First National Bank Bldg.

SEATTLE, WASH.
Hoge Building

Talking quality boosts sales



Your sales will go up and your selling cost will go down if you take advantage of the selling points of high class standard merchandise, such as:—

AMERICAN RADIATORS & IDEAL BOILERS

Nothing really satisfies a purchaser unless the article he buys is the best of its kind. He may buy something else, but he will always wish he had bought the best.

As a merchant, selling AMERICAN Radiators and IDEAL Boilers, you will quickly discover how easy it is to sell goods of well-known quality. The very fact that you propose to furnish AMERICAN Radiators, an IDEAL Boiler and an ARCO WAND Vacuum Cleaner aids you in making a contract.

By so doing you establish confidence, for everyone knows that the merchant who does business with the leading manufacturers must be a leader himself. As soon as confidence is established, the contract is quickly closed.

The strong points of AMERICAN Radiators are almost inexhaustible. Listen to one of our salesmen while he relates some of them to one of your prospective customers. Ask him to make house-owner calls with you. Boom the year's total of earnings by reducing selling expense.

Send your customers to the showroom of our nearby Branch.
Thirty-three Branches in Leading Cities

AMERICAN RADIATOR COMPANY

General Offices, Chicago